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SONOMA COUNTY SOLID WASTE STABILIZATION STUDY

EMCON Associates

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This report documents all three years of a three-year demonstration project sponsored by EPA and Sonoma County, California. The purpose of the project was twofold: (1) to investigate the stabilization of solid waste in a sanitary landfill by analyzing leachate, gas, temperature and settlement parameters, and (2) to determine the effect on solid waste stablization of applying, under various operational modes, excess water, septic tank pumpings, and recycled leachate in a sanitary landfill. This report describes the investigation of the test site, construction, instrumentation, and site operations and discusses the data produced with some conclusions based on extensive monitoring. Tables and figures following this report summarize the detailed data presented in the appendices.

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1975

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PREFACE

Sanitary landfilling involves (1) the placement of refuse in a manner which will not degrade the land-water-air environment of the disposal site, (2) the compaction of the refuse to the smallest practical volume, (3) the daily covering of the refuse with a layer of earth and (4) the performance of disposal operations without creating nuisances or hazards to the health and safety of the surrounding community.

Once disposed of in a sanitary landfill, the refuse presents a potential source of pollution for a period of 10's to 100's of years. The introduction of large quantities of water into the sanitary fill either by acts of nature such as floods and rising groundwater or by negligence of man through inadequate grading, drainage, or maintenance of the earth cover can release pollutants from the decomposing refuse to contaminate the groundwater and surface waters.

The study discussed in this report was conceived to test the hypothesis that stabilization of refuse in a sanitary landfill can be accelerated by the controlled application of water thereby reducing the period of time during which the landfill presents a potential source of pollution and the risk that such pollution might occur.

The stabilization of household refuse in a sanitary landfill is being investigated in five large-scale field test cells. The refuse in the test cells is subjected to various moisture conditions and mediums through the controlled application of excess water, septic tank pumpings and recycled leachate. The stabilization of the refuse is measured by monitoring and analysis of leachate, gas, temperature and settlement of the sanitary landfill. In addition, the groundwater in the vicinity of the test cells is tested periodically to detect any significant change of quality.

This study is funded principally by the Environmental Protection Agency under Demonstration Grant No. G06-EC-00351 of the EPA Office of Solid Waste Management Programs. Partial funding of the 3 year demonstration project is provided by the County of Sonoma, Project Sponsor.

Project Management

Mr. Donald B. Head, Director of Public Works, County of Sonoma is Project Director. All project activities are directly supervised by the Assistant Director of Public Works for Sonoma County, Mr. Duane Butler. Project Engineer assisting Mr. Butler is Mr. Johnny Conaway.

Emcon Associates, Consultants in Waste Management, provides technical direction and input to the project, as well as the laboratory testing and analysis. Their services are under the direction of Project Manager, Mr. John G. Pacey. Dr. James Leckie of Stanford University provides biological-chemical consulting expertise through Emcon Associates.

Acknowledgments

Among those who contributed significantly to the study were the staff of the Environmental Protection Agency in Cincinnati, Ohio; the State of California Department of Public Health; the State of California Department of Water Resources; the County of Sonoma Sanitation Department ; and students of Sonoma State College and Santa Rosa Community College.

I - INTRODUCTION

The investigation which forms the subject of this report was authorized under a three-year demonstration grant project sponsored by EPA and the County of Sonoma, California. The purpose of the project is twofold:

1. To investigate the stabilization of refuse in a sanitary landfill by analyzing leachate, gas, temperature and settlement parameters.
2. To determine the effect on refuse stabilization of applying, under various operational modes, excess water, septic tank pumpings and recycled leachate to a sanitary landfill.

The stabilization of refuse is monitored in five instrumented field scale test cells. Each test cell is subjected to a different controlled moisture condition and/or liquid character. The liquid conditioning and purpose of each cell are set forth in Table 1.

This report documents the site investigation, construction, instrumentation and site operations and presents and discusses data generated during the three-year demonstration grant project.

The work was conducted jointly by the staffs of Sonoma County Department of Public Works and Emcon Associates, the County's consultant, and includes the following:

1. Geotechnical investigation of test site.
2. Construction and instrumentation of clay barrier.
3. Design and construction of five field scale refuse test cells and various monitoring instruments and facilities for distribution, collection and storage of leachate and water added to, or withdrawn from the test cells.
4. Compositional analysis of refuse placed in the test cells.

5. Monitoring of refuse stabilization parameters, including leachate and gas composition, temperature and settlement.
6. Monitoring of selected groundwater parameters to determine the effect of the project on the quality of the groundwater.
7. Development of leachate and gas sampling and analytical procedures.

During the first six months of the study, the geotechnical investigation of the test cell area was accomplished, the test cells were constructed, refuse placed, and the cells were covered. From that time data has been collected on a scheduled basis concerning refuse settlement, cell temperatures, gas composition and leachate composition, as well as external parameters concerning groundwater quality. Mean temperature, rainfall, evaporation, storm runoff and quantity of liquid added to and withdrawn from each test cell are also monitored.

Discussion presented in this report follows the sequence in which the activities occured, namely the first portions of the report describe the geotechnical investigation and construction activities followed by a discussion of instrumentation, compositional analysis of the refuse, pertinent operations and management procedures and the monitoring program. The main thrust of this report is a discussion of refuse stabilization as measured by extensive monitored data. Tables and figures following the text of this report summarize the detailed data presented in the appendices.

Readers wishing to examine closely the quantitative data will find this information in the appendices following the main body of this report.

II - GEOTECHNICAL INVESTIGATION - TEST CELL AREA

Scope of Work

The initial work element for the demonstration grant was a geotechnical investigation of the test cell area located within the Central Disposal Site in Sonoma County, California. The purpose of the investigation was (1) to determine the material types and conditions underlying the test cell area, (2) to determine the suitability of the site for the proposed use, and (3) to prepare appropriate recommendations concerning the geotechnical aspects of the research program.

The scope of work completed in this investigation included a surface and subsurface investigation, a review of geologic and engineering data, laboratory testing of selected soil samples to determine the pertinent physical and mechanical properties of the foundation materials, and the evaluation of this data to determine the suitability of the area for the intended program.

Site Description

The Central Disposal Site is located in the southwestern portion of Sonoma County, approximately 45 road miles north of San Francisco, California. (See Figure 1) The site consists of approximately 400 acres of sparsely-wooded grazing land in the well-rounded foothills of the Northern Coast Range. It is located well away from the path of urbanization, within a relatively short travel distance of central service areas. An improved all-weather road leads to the large central canyon. This canyon will provide capacity for disposal of solid waste generated in Sonoma County well beyond the year 2000.

An area for the test cells was selected about midway up the central canyon in a relatively flat portion of the valley, just east of the main drainage channel, (see Figure 2.) A small tributary drainage channel passes through the test cell area bisecting it approximately in half, with three cells located to the north and two to the south of the tributary channel.

Placement of sanitary fill at the Central Disposal Site commenced in the main canyon just above (north) the test cell area. Landfilling will proceed up the canyon away from the test cells. The test cell area should therefore be available for uninterrupted research activities for many years to come.

Geology

The Central Disposal Site is underlain primarily by marine sediments of the Franciscan Formation, (see Geologic Map, figure 2) These Jura-cretaceous rocks consist of sandy clayey shale with interbedded sandstones and silicic chert beds. Geologic structure in the Franciscan Formation sediments is extremely complex reflecting a turbulent history of faulting, folding and shearing. The trend of this bedrock system is generally northwest-southeast through the Northern Coast Ranges of California.

The surface and near-surface deposits within the valley portions of the site contain relatively thin deposits of poorly-consolidated sediments of younger Merced Formation. The Merced Formation rocks are of Plio-Pleistocene Age and consist essentially of gravelly sandstones with interbeds of sandy clay and silt. The basal portion of the Merced Formation contains a zone of well-indurated impervious volcanic tuff breccia. Sediments of the Merced Formation have been deposited on an old erosion surface (valley) of the underlying older Franciscan Formation. The poorly-consolidated sediments of the Merced Formation are relatively undisturbed as indicated by their near-horizontal attitude and uninterrupted continuity.

Subsurface Exploration

Five exploration trenches were excavated in the test cell area in order to examine foundation soil types and conditions and thereby determine the most suitable location for the cells from the standpoint of geology.

The locations of the trenches are shown on Figure 3 and the logs of soils encountered in the trenches are presented in Appendix A. In general, the materials encountered in the excavation were comprised of sandy and silty clays and clayey sands. Some gravel was encountered in each trench and free water was observed in trench 4.

Groundwater

Sedimentary rocks of the Franciscan formation are considered to be essentially barren of fresh water. Locally, however, these well-consolidated rock units contain small supplies of poor to fair quality water which is used for domestic and stock water supply. The more successful low-yield wells tap water supplies in deeply-weathered or highly-fractured rock. These marginal supplies of poor quality water do not constitute a protectable resource. Sediments of the Merced Formation contain groundwater of moderate to high quality in the more pervious strata. This water is contained in beds of sand, lenses of gravels and occasionally in lenses of permeable volcanic rock.

Groundwater was encountered in thin beds of clayey sand and gravel just above the basal tuff breccia in each of the drill holes in the canyon bottom areas. This aquifer ranged in thickness from two to ten feet and occurred from 15 to 25 feet below ground surface. The groundwater encountered in this formation was confined by overlying clays of low permeability and artesian pressure heads ranged from ten to nearly twenty feet in exploration drill holes. Production capacities from wells in this thin stratum are estimated to be marginal, but known hydraulic continuity between this aquifer and major production aquifers to the south established the absolute need to prevent pollution of this aquifer by harmful materials originating in the refuse fill.

In addition to the subsurface groundwater, at least one perennial and two intermittent springs exist in the large canyon at the upper end of the Central Disposal Site. The backhoe investigation in the test cell area revealed little groundwater within twelve feet of the ground surface.

Laboratory Investigation

Representative soil samples recovered from the exploration trenches were tested in the laboratory to determine their physical and mechanical characteristics. Test data are presented in Appendix A. Based on the results of these laboratory tests, it was concluded that the clay soils possess a permeability of less than one foot per year and soils excavated for construction of the test cells can be readily recompacted.

Conclusions

Based on the results of the field and laboratory investigation, we determined that the test cell area was suitable for the research test cells. It was decided that excavations for construction of the test cells should terminate within the upper sandy clay and clayey sand materials of low permeability. Application of this criteria, tempered by drainage considerations and evaluation of the cut-and-fill material balance, resulted in the siting of the test cells at the locations shown on the plans.

The native soils in their existing state were considered generally satisfactory for retaining any leachate developed during excavation of the test cells. Occasional lenses or layers of more pervious waterbearing soils were expected in the cell excavations. Such areas were to be over-excavated two feet and an impervious clay lining was to be placed to restore the test cells to design grade. Material generated from excavation of the cells was considered suitable for construction of the embankment portion of the test cells. The resulting test cells would thus be relatively impervious and capable of retaining leachate and gases.

III-PROJECT CONSTRUCTION

Project construction generally proceeded as originally designed and presented on the drawings which accompanied the demonstration grant application. However, some design modifications were made during construction to meet changed conditions and reflect additional decisions. Final construction details are shown on Figures 5, 6 and 7 "As Built" drawings.

CELL CONSTRUCTION

Excavation

The test cells were excavated to design grade and the material removed was stockpiled adjacent to the cells.

Some groundwater was encountered in the excavation of Cells A and E. As a consequence, the subsurface drains above Cell A and E and above Cells B through D were installed prior to construction of the embankment.

After excavation to design grade, the ground surface was inspected to determine the presence of any pervious lenses within the cell configuration. A thin zone of pervious material was encountered in Cells A and E. This material was removed by overexcavating two feet. This area was then restored to design grade with a two-foot-thick layer of compacted clay.

Embankment

The embankment areas of the test cells were first stripped of all surface organic matter. The ground surface was then scarified and compacted. The stockpiled material from cell excavation was utilized as embankment fill and was placed in lifts of six inch uncompacted thickness. The lifts were moisture conditioned as necessary to achieve proper compaction and compacted by numerous passes of a 5 x 5 sheepsfoot compactor drawn by a D-7 tractor and a Buffalo Springfield steel wheeled compactor.

Field density tests were taken during the placement operation to determine the relative compaction of the embankment materials. Results of the field density tests and laboratory control curves are presented in Appendix B. Field density measurements were made at the locations shown in figure 4.

When the downhill embankment had been constructed to a level two feet above the floor of the cell, trenches for the leachate collection lines were excavated in the bottom of the cell and a trench was excavated through the embankment for the leachate line discharging to the collection tank. Leachate collection lines were placed in the trenches and backfilled. The trench through the embankment was backfilled with a combination of native soil and 10% bentonite, by weight, in order to assure an impervious backfill. The embankments were then raised to design grade. A shallow trench was excavated on the inside slope from the top of the embankment to the base of the cell for installation of the lysimeter and gas collection lines.

Leachate Collection System

After the cells were excavated and graded and the embankments had been constructed to an elevation two feet above the base of the cells, trenches were excavated in the base of the cells and through the embankments for placement of the leachate collection lines. Pea gravel was placed around the collection lines in Cell C and D.

All collection tanks were positioned below the test cells with the top of tank below the base of the test cells, thereby assuring positive drainage of leachate into the collection facilities.

In Cells A and E single leachate collection line was installed across the lower (west) side of the base as only a small quantity of leachate was expected. A full system of leachate collection lines was installed in Cells B through D to collect the large quantities of leachate expected from these cells. Cell B was expected to develop a considerable quantity of leachate only during the initial charging to field capacity. Nevertheless, the quantity expected was such that a full collection system was installed.

Granular Materials

Granular materials were used as backfill in the leachate collection trenches and for distribution material between the distribution lines and refuse in Cell C and D. Mechanical analyses of potentially suitable materials were performed prior to cell construction (See Appendix B). Concrete sand and muck sand from Basalt were accepted for the silty sand and concrete sand requirements. Pea gravel was substituted for the proposed fine soil backfill material on leachate collection lines in Cells C and D and for material placed between refuse and distribution lines in Cell D. This substitution was made to avoid the filtering action that might occur when leachate passes through fine soil.

Refuse

Refuse was initially dumped at the edge of the cell and then pushed into the cell and spread by a D-7 dozer. The dozer compacted the refuse in a manner similar to the procedures that would be used in the normal sanitary landfill operation. Detailed refuse placement history is presented in Appendix 1.

All incoming refuse was weighed. Samples of the refuse were obtained for compositional analyses in accordance with accepted statistical sampling methods. The samples were hand sorted into appropriate waste categories in a covered work area within five miles of the job site.

Cover Material

Cover material generally consisted of the stockpiled sandy clay material from cell excavation. The cover material was placed as a two-foot capping over the refuse in Cells A, B and E. A one-foot thickness of permeable material was placed between the refuse and sandy clay cover in Cell C and D to facilitate distribution of water and leachate. In Cell C this one-foot of material consisted of a layer of fine silty sand placed directly overlying the refuse. A six inch mound of concrete sand was placed around the liquid distribution lines installed between the silty sand and cover material. A 12-inch layer of pea gravel (in lieu of silty sand) was placed between the refuse and cover material in Cell D to minimize any filtration of leachate.

The sandy clay was spread in one-foot lifts and compacted by numerous passes of a D-7 dozer. Two-inch-diameter holes were augered through the cell cover at intervals of 10 feet to permit measurement of the in-place thickness of cover material. The cover thickness measurements for all cells are presented in Appendix B.

Leachate Distribution System

As previously mentioned, a twelve-inch layer of pea gravel was placed over the refuse in Cell D in lieu of the originally planned fine silty sand spreading medium. Elimination of the spreading medium necessitated further changes in the distribution system for Cell D to assure uniform application of recycled leachate over the refuse. The changes consisted of the installation of two separate leachate distribution systems utilizing eight lines each with lines more closely spaced than the originally planned eleven line system. The decreased total footage in each system made necessary an increase in the size of the small discharge holes to maintain planned distribution rates. This had the side benefit of reducing the potential for plugging of the holes by solids in the leachate.

Clay Barrier Construction

An impervious clay barrier was constructed across the lower end of the central canyon, below (south) of the test cells and central disposal areas, to block the subsurface escape of leachate and gases which might emanate from the sanitary landfill and test cells. See Figure 8 for maximum cross section.

Native sandy clay soils were excavated to bedrock in preparation for construction of the barrier. Conditions encountered in the excavation were as originally estimated with the maximum depth of excavation being 30 to 35 feet below the valley floor or approximately 20 to 25 feet below the canyon creek channel. The excavation was inspected by Mr. Jack McCollough, the Engineering Geologist involved in the original investigation of the valley, and Mr. John Pacey, Consulting Engineer for the construction phase of the grant project.

A sump was excavated at the low point of excavation on the downstream side of the barrier excavation and backfilled with granular material. A perforated pipe was installed in the sump and extended to the natural ground surface to permit future removal of seepage waters collected in the drainage blanket, if required.

The barrier was constructed by backfilling the excavation with sandy clay soil obtained from the excavation. The fill material was spread by a D-8 Caterpillar Tractor in relatively thin lifts which were moisture conditioned as necessary to permit achievement of the required relative compaction and compacted by numerous passes of a 5 x 5 Sheepsfoot roller drum pulled by a TD-24 tractor. A sand drainage blanket was placed between the downstream face of the clay barrier and natural ground.

A moisture-density curve was developed in our laboratory to establish relative compaction parameters for the backfill material in accordance with ASTM Test Designation D698-70. Field density tests were performed periodically during the filling operation at random locations. Test methods utilized included both the sand cone method (ASTM Test Designation D 1556) and the nuclear density test method (ASTM Test Designation D2922-71). The field density test results and laboratory compaction curve are presented in Appendix C.

The barrier was constructed up to a point slightly above the stream channel elevation under the inspection and testing control of Mr. James Cleary of Emcon Associates. County personnel directed and inspected the placement of additional fill required to raise the grade up to the natural ground surface and to provide an aesthetically-pleasing finish ground surface. No tests were performed on this final 10 feet of fill, as this work was principally for aesthetic purposes. Nevertheless, precautions were taken by County Staff to assure that the material was properly moisture conditioned and compacted.

IV - INSTRUMENTATION

Stabilization of the refuse is monitored by instruments installed in the test cells and by testing of leachate and gas samples withdrawn from the cells at programmed intervals. Instrumentation installed for refuse stabilization data retrieval include gas probes, thermistors, settlement monuments and leachate collection facilities.

Evaporation, rainfall and cell runoff data necessary to evaluate rainfall infiltration into the test cells, are recorded respectively by an evaporimeter, rain gauge and two flow meters. Additional flow meters connected at appropriate locations in the collection, discharge and distribution piping, record the daily application of water to Cell C and makeup water applied to Cell D, as well as the quantity of leachate produced by Cells C and D.

Instrumentation for obtaining groundwater samples and measuring its quality include observation wells installed downhill and uphill of the test cells and up-valley of the clay barrier, and lysimeters installed below each test cell. Groundwater levels within and beneath the clay barrier are monitored by piezometers.

Instrument locations and identification symbols used in recording data developed are shown on Figure 9. Detailed drawings of the instruments utilized are presented in Appendix D.

V - REFUSE COMPOSITIONAL ANALYSIS

The composition and moisture content of refuse placed in the test cells was determined by analyzing refuse samples selected by statistical sampling methods. The sampling schedule was derived by use of Random Sample numbers, as noted and shown on Plate 1, Appendix E.

Sample Procurement Procedure

The weigh master marked the refuse trucks containing refuse to be sampled as it left the scale. Trucks marked for sampling were directed by the traffic dispatcher to deposit its load of refuse adjacent to the designated cell. A front loader scooped 300 or more pounds of refuse at random from this pile and loaded it into the bed of a pickup truck. The sample was then enclosed in a canvas tarp and transported to the sorting center which was located about 5 miles east in the county road maintenance yard at Cotati.

The sample was removed from the truck, placed on a thick black plastic ground cloth and sorted. Forty-two part-time employees, primarily students from Sonoma State College and Santa Rosa Community College, were employed to sort the refuse samples. Ten labelled 32-gallon trash cans with plastic liners were positioned around the sample. Two to six students classified, segregated and deposited the material in the trash cans. Approximately 10 man-hours were required to sort a sample. The material was sorted into the following 10 categories:

1. Food Waste
2. Garden Waste
3. Paper
4. Plastics, Rubber, Leather
5. Textiles
6. Wood
7. Metals
8. Glass
9. Ash, Rock, Dirt
10. Fines

After the sample was sorted, all cans in each category were weighed and recorded. The total weight of waste in each category is presented on plates 2-6, Appendix E.

Sorting Guidelines

1. Synthetic material was classified as a plastic.
2. Fines were defined as any material that would pass through a 1" sieve. No further classification was attempted.
3. Wood was wood material that had been processed at a mill, i.e., a 2x4 was classified as wood, but a tree limb or branch was classified as garden waste.
4. Food wastes included: bones, shells, feathers, and fecal material. Food wastes were scraped out of their containers and the container deposited into its appropriate category.
5. Labels were left on containers.

Moisture Determination

The samples of segregated refuse were bulky, took a long time to dry and generated an obnoxious odor while drying. The small capacity ovens of the Sonoma County Soils Lab were not adequate to handle the large number of samples obtained, therefore County staff designed and built two drying racks that could hold sixteen 2 feet x 4 feet x 6 inch deep sheet metal trays. The racks were enclosed with sheet metal and heated by a propane-fired forced air heater. This system maintained a relatively constant temperature of 105° F, drying most samples in from 2 to 6 days.

All samples were weighed before being placed in the drier. The samples were subsequently checked and their weights recorded every morning and evening. When two consecutive recorded weights were equal, the sample was considered dry.

Data was obtained for two types of moisture samples:

1. Total Sample - A sample was extracted from the sorting sample as it was loaded onto the pickup truck at the test cells. This sample contained a representative amount of all constituents and was not sorted.

These samples were dried separately and the data is reported on plates 7-11, appendix E in the four, left hand columns.

2. Composite Sample - Samples of each of the ten constituents from each sorted sample were obtained and sealed in plastic bags. Four or more of these like category samples were combined for this drying procedure. In combining the samples only sequential samples were used and the constituent samples of one cell were never mixed with those of another. This data is reported on plates 7-11, appendix E in the ten, right-hand columns. The samples from which the composite sample was generated are listed under the appropriate grouping.

VI - OPERATIONS AND MANAGEMENT

AUTOMATIC OPERATIONS

Liquid Collection and Distribution System

Cell C and D distribution and collection systems are controlled by a central timer that activates twice daily at pre-set intervals. Four standard house service water meters measure the quantity of liquids applied to and discharged from the cells. One meter measures the fresh water inflow to the Cell C distribution system. One meter is connected to the leachate collection tank discharge line of Cell C and records the quantity of leachate pumped from the collection tank and disposed of in the adjacent main landfill. A meter is installed in Cell D leachate return line and records the leachate recycled through Cell D. The final meter is on the fresh water system for Cell D and records the make-up water that is added to maintain the desired quantity of liquid recycled through Cell D.

Cell A & E leachate is metered by a house service water meter and discharged to the main landfill with an electric pump. Cell B leachate is discharged to a collection tank and the quantity is measured with a graduated bucket. The leachate is disposed of in the main landfill.

Storm Runoff Collection and Monitoring System

Storm runoff from Cell B and the combined runoff from Cells A and E is collected in swales constructed in the cell embankments and discharged through drainage inlets to collection tanks. The collection tanks discharge through Sparling low pressure line meters which record the runoff quantity.

MONITORING AND MANAGEMENT

The site is inspected daily by disposal operation's personnel to check for any vandalism, theft or equipment malfunction. An office engineer visits the test cell site weekly for a detailed check on all systems and to record the monitoring data. His duties are:

1) Record all meter readings.
2) Check, retrieve and replace charts on the recording evapormeter and rain gauge.
3) Test the discharge rates for Cell C and D distribution systems.
4) Check and test automatic timing system.
5) Record meter readings on storm runoff metering devices.

MAINTENANCE

Although the Cell design and construction minimized the maintenance functions, three basic operational maintenance functions remain:

1) Since water service is not available at the site, water is hauled by truck to a 6,000 gallon storage tank that supplies the daily water for Cell 'C' distribution and the makeup water for Cell D.
2) The distribution lines in Cells C & D have to be cleaned periodically.

   Cell C - The clear plastic tubing, connecting the discharge maniford pipe to the small diameter distribution pipe have to be periodically cleaned of algae.

   Cell D - The small diameter discharge holes in the distribution piping clog due to fungus growth caused by the leachate. These holes must be cleaned periodically.
3) The leachate generated from Cells A, B, C, E, and the adjacent sanitary landfill is pumped into the sanitary landfill. A 22-foot deep, 6-inch diameter gravel-packed well was drilled in the main landfill refuse and is presently accepting all excess leachate from this project. This construction is of a temporary nature and has to be checked and serviced because of line breakage due to landfill equipment operations.

VII - MONITORING PROGRAM

GENERAL

The monitoring program involves the collection of liquid and gas samples for field and laboratory testing and retrieval of data from instruments installed in and about the test cells and clay barrier.

Monitoring activities are carried out jointly by the staffs of Sonoma County Department of Public Works and Emcon Associates. Rainfall, evaporation, storm runoff and refuse settlement, as well as the metering of water and leachate flows into and out of Cells C and D are monitored by Sonoma County Staff. The staff of Emcon Associates collects and tests samples of leachate, gas, Cell C input water, and groundwater, and monitors lysimeters, thermisters, and groundwater levels.

All monitored data is presented in Appendix H.

SAMPLING AND TESTING SCHEDULES

Sampling and testing of leachate and groundwater commenced in December 1971. In February 1972, a formal schedule for frequency of leachate, gas and groundwater sampling and analysis was adopted.

The initial and revised sampling and testing schedules are presented in Appendix F.

SAMPLE COLLECTION

Leachate, Groundwater, and Water Added to Cell C and D

Leachate samples are obtained at sampling valves located in the collection line just upstream from the leachate collection tank. The collection line discharges into the collection tank through a riser which extends above the elevation of the sampling valve. This arrangement minimizes the exposure of the leachate to the atmosphere.

The groundwater is sampled and tested to detect any contamination by leachate escaping from the cells. Groundwater samples are bailed or pumped from the observation wells and periodically collected from the Cell A and E subdrain outfall. Samples of water added to Cell C are obtained directly from the water distribution tank. The exposure of the groundwater samples to air during the bailing and collection process, although not desirable, is not considered detrimental to detection of contamination by leachate.

All samples of leachate and water are field tested for pH, dissolved oxygen, electro-conductivity and temperature. These tests require approximately 100 to 200 ml. samples. Samples scheduled for laboratory testing of parameters that deteriorate rapidly with time are treated with a compatible preservative. Samples are stored on ice from the time they are collected until they are delivered to the laboratory. Upon arrival at the laboratory the samples are refrigerated until tested. Sampling and test procedures are discussed in detail in Appendix G.

Gas

Gas samples are collected from the cell gas probes in gas sample tubes. Sampling procedures and the gas analysis test method are presented in Appendix G.

Lysimeters

Lysimeters are sampled periodically by injecting compressed air through one of two 1/4 inch tubings connected to the lysimeter. The fluid sample is discharged from the second 1/4 inch tubing and collected for testing. Fluid collected is field tested for pH, dissolved oxygen and, when sufficient quantity is available, electro-conductivity.

Fluid Distribution and Leachate Production

Flow meters, installed at appropriate locations in the distribution and collection piping of Cells C and D, are read periodically to determine the quantity of fluid entering and leaving the cells.

VIII - DISCUSSION

REFUSE STABILIZATION AND LEACHATE COMPOSITION

General Considerations

Sanitary landfilling is now widely utilized for the disposal of solid waste. Careful planning and the application of sound engineering principles to all facets of disposal site selection, design, construction, and operation help insure that the environmental impact of landfilling is minimal and, in many cases, beneficial. With increased use and public awareness of this method of disposal, increased interest has also developed with respect to the pollution potential of leachate emanating from a landfill, its possible detrimental effects upon surface water and groundwater, and a realization that in some cases, interception and treatment of this liquid may be necessary. Considerable research on leachate treatment is presently on-going in many laboratories.

Leachate production has been frequently documented by field observations and case histories. Production of leachate is most prevalent in geographical areas which have relatively high annual rainfall. Limited data collected to date indicate that fresh (initial) leachates are extremely high in both organic and inorganic constituents and provide potential sources of significant amounts of pollutants. Subsequent leachate contains less pollutants as time passes.

A large number of variables can interact to produce variable quantity and quality of leachate from landfills. A few of the relevant parameters affecting leachate quantity and quality are: annual rainfall, runoff, infiltration, evaporation, freezing, transpiration, ambient temperature, waste composition, waste density, initial moisutre content, and depth of landfill. Additional variables are macro and micro nutrients, and toxic elements and compounds.

Studies of leachate composition indicate wide variation from site to site and at any given site with time. A summary of typical leachate composition is provided in Table 2. Adding to the complexity of the problem is the fact that the volume of leachate produced frequently varies widely over time at any one site.

The biologic decomposition of organic wastes also generates gas of varying composition. The gas usually consists of varying concentrations of oxygen, nitrogen, carbon dioxide and methane. The gas composition reflects the type and extent of biologic processes occurring in the refuse.

This study was designed to investigate the effect of several modes of operation upon the rate and extent of stabilization of municipal refuse in sanitary landfills. Five test cells were constructed and subjected to the operational modes presented in Table 1. The modes of operation chosen for this study include: (1) addition of an excess volume of water after refuse emplacement, (2) continual through-flushing with water, (3) recirculation of leachate, and (4) addition of septic tank pumpings to the landfill materials.

The extent of refuse stabilization was evaluated principally by monitoring leachate and gas composition during a two and one half year period. Primary leachate composition parameters monitored included biochemical oxygen demand (BOD), chemical oxygen demand (COD), pH, alkalinity, volatile acids, phosphate, and forms of nitrogen. In addition, electrical conductivity, temperature, and various inorganic anions and cations were monitored to define leachate composition. The time response of these parameters is presented in Figures 10 through 40. A discussion and comparison of refuse composition is presented, followed by a short discussion of the general effect of seasonal variation of moisture content, rainfall infiltration, and temperature, after which each test cell is discussed separately with comparisons made to both the control cell and to literature information.

Refuse Composition

Refuse compositional analysis data is presented in Appendix E and is summarized in Table 3, Refuse Moisture Content Summary, and Table 4, Refuse Composition Summary. Both moisture and weight percentage figures for the various waste constituents are quite similar for all cells. The average weight percentage of waste constituents from all cells are compared with similar compositional data for the City of Berkeley, California, the County of Santa Clara, California (Golueke & McGauhey, 1970), and work by Dr. Pohland at the Georgia Institute of Technology in Table 5. The average values determined for the various waste constituents in the Sonoma County study are reasonably similar to the values developed for the City of Berkeley and the County of Santa Clara. Each of the California studies differ significantly from Dr. Pohland's Georgia study in percentage of textiles, metals, glass and food wastes. Data from Dr. Pohland's study is included, as several of his project objectives parallel objectives of this study.

The Sonoma study developed a somewhat lower percentage by weight of paper as compared to the City of Berkeley, Santa Clara County and Dr. Pohland's study figures. Frequently, paper is reported in the literature as comprising over 45 percent of the total waste. The most recent finding by the National Center for Resource Recovery (1973), however, indicates the national average of paper content is 35 percent.

Moisture Content

Moisture content of landfill materials during active decomposition of organic components is one of the most important in situ factors affecting the rate and nature of biological processes as well as the quantity and quality of the gas and quality of the liquid leachate ultimately produced. All sources of moisture must be considered important, and they are: water content of initial refuse, metabolic water formed during decomposition (usually minor), infiltration water due to rainfall or groundwater, and any artificially added water.

In this study five test cells have been utilized to investigate, among other things, five different moisture regimes (Table 1). The usefulness and practicality of operationally controlling or modifying the moisture content of a solid waste landfill has been approached from a two-fold point of view: (1) to study the resultant change, if any, in rate of stabilization of the landfill materials, and (2) to investigate the quality of leachate produced both as a measure of (1) above and as a measure of potential pollution of adjacent groundwater sources.

The test conditions chosen for this study were (1) ambient moisture conditions of the refuse material and any natural infiltration water (Cell A); (2) cell refuse materials brought to field capacity* by addition of fresh water and then no further intentional additions of water (Cell B); (3) fresh water added to the top of the refuse and removed from the base at a rate of 700± gallons per day continuously (Cell C); (4) leachate recirculated through the refuse at the rate of 1000± gallons per day using freshwater make-up as necessary to compensate for losses (Cell D); (5) cell refuse materials brought to field capacity by the addition of septic tank pumpings and then no further intentional liquid additions (Cell E). In each case, refuse was emplaced in a cell constructed with impervious clay base and walls. The cell surface was then sealed with an impervious layer of clay to preclude infiltration.

It soon became obvious that little or no leachate would be produced in Cells A, B and E unless additional water was added. Since leachate analysis data comprised the principal evaluation methodology in the program, it was apparent that additional water input to these cells was necessary to develop some leachate for testing and analysis. Consequently, rather than seal surface cracks resulting from summer drying, winter rainfall was permitted to find its way into the cell refuse by short circuiting through cracks in the cover material. After some surface water from the first winter rains entered the refuse, natural swelling of the soil sealed the surface cracks and thereafter the cover material was relatively impervious.

Infiltration water influences the moisture content of the cells, and hence, the process of refuse stabilization. Rainfall records (Figure 30) for the study site show very little precipitation occurred during the first winter (1971-72). In addition, the cells were completed in the winter and no drying cracks occurred in this first rainy season. Consequently, very little leachate developed as a result of infiltration. The second winter (1972-73) however, was a year of near-record rainfall, and leachate was developed in all cells, indicating infiltration. The pattern of increased leachate production following heavy rainfall was repeated during winter 1973-74 (Figure 30).

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*Field capacity is defined as the condition achieved by adding water to the point where a significant volume of leachate is just produced.

Cell D was a fully saturated system prior to the heavy 1972-73 winter rains and has been monitored on a continuous basis. Prior to the winter rains, (before November 1972), the quantity of recirculated leachate applied to Cell D was approximately 6,000 to 8,000 gallons per week (Figure 33). The maximum quantity of recirculated leachate put through Cell D was approximately 37,000 gallons per week (February and March 1973). This large increased volume of recycled leachate was due primarily to infiltrated rainwater, as is evidenced by a repeated increase in recycled leachate following heavy rainfall in winter 1973-74, with maximum recycled volume occurring during March-April, 1974 (Figure 33).

There are some differences in infiltration rates between cells. The refuse in both Cells B and E was wetted to field capacity, but the cells responded to the initial infiltrated volume of rain water (winter 1972-73) in different manners (Figure 30). It is not clear why the rate of leachate production was so different between Cells B and E during this time, but it may have resulted from a combination of different permeability of the soil cover layer and differences in the rate of stabilization due to mode of operation. Cell E was originally seeded with 27,200 gallons of septic tank pumpings and also received 7,400 gallons of rainfall before the cell cover was placed. The cell gave early indications of vigorous anaerobic biological activity. Approximately 41,000 gallons of water were added to Cell B to bring it to field capacity before the top cover was applied (Table 1). When compared to control Cell A, both Cells B and E show considerably greater production of leachate. Leachate production during and following heavy winter rains (1973-74) indicates that on a cumulative basis Cell B and Cell E are presently substantially equivalent in terms of leachate volume produced.

Thermal Response

Although chemical and biological processes are, in general, termperature dependent both as to rate and ultimate equilibria, it is not reasonable at the present time to speculate on the effect of temperature on leachate composition other than in general terms. The multiplicity of chemical and biological processes occurring within a landfill are so complex as to preclude any attempt at rigorous treatment. On the other hand, observation indicates real differences in cell temperatures with time, depth and mode of operation.

The seasonal temperature variations for this study (Figures 34-39) show an ambient range of almost 20° C. over the annual cycle. In general, there is an apparent temperature response of the upper several feet of the landfill to long term (seasonal, annual) variations in mean ambient temperature (monthly mean)*, while the deeper materials tend to show a smaller response (Figures 35-39). An annual mean temperature variation of 16° C. was observed at the site of this study, but larger annual temperature changes would be expected under different climatological conditions. Short term (diurnal) variations in ambient air temperature appeared to have no appreciable effect on the cell temperature regime.

The literature on both diurnal and annual cycles of heating and cooling of soil shows a typical lag in heating and cooling at depth compared to the annual or diurnal surface cycle (Geiger, 1965; Singer and Brown (1956). The exact lag depends upon latitude, media porosity, and depth from surface (Strahler and Strahler, 1973).

For each climate region there is a depth below which the soil or rock temperature is essentially unchanging year round, and this temperature is typically very close to the average annual air temperature near the ground surface (Strahler, 1971; Riehl, 1972).

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*National Weather Service Data collected at Petaluma, California Fire Station No. 2

Thermal response of Cells A, B and E as a function of depth over two complete annual cycles is depicted in Figures 35, 36 and 37. Cells A, B and E have not been disturbed in any way since placement of initial materials. Typical moderation of maximum and minimum temperature is seen with increase in depth as is the shift in time of maximum thermal response as compared to mean ambient air temperature. In contrast, Cells C and D, which receive daily applications of liquid, show a pronounced thermal response over the whole depth with the seasonal cycle (Figures 38 and 39). This corresponds to both the mean monthly air temperature and the temperature of water added (Cell C) and the leachate recirculated (Cell D). This termal response over the total depth of the cell reflects the fact that the temperature of the applied liquid tends to approach mean ambient air temperature at the time of application.

SAMPLING AND ANALYTICAL METHODS

General

Experience with sampling procedures and analytical methods on numerous samples of leachate has necessitated changes in both sampling techniques and analytical methods. The need for such changes was generally anticipated, but it was not possible to specifically predict them, as leachate exhibits a complex and changing nature.

The following general statements can be made about analytical methods as related to leachate tests:

1. The analytical philosophy should be one of attention to accuracy rather than precision.
2. The analysis is made difficult by the danger of interferences due to the high concentration of solutes and the changing nature of the leachate.
3. Colorimetric methods are generally not applicable due to the complex nature of the solution and the high background color of undiluted leachate samples. For

example, it is not possible to analyze for calcium and magnesium on undiluted leachate samples using the normal EDTA titrimetric technique due to masking of the end point by background color.

4. The concentrations of most common constituents in leachate are generally very high and require dilution prior to analysis.

5. Matrix effects were observed in the analysis of some parameters.

Experience with analysis of several leachate constituents has indicated unusual and persistent problems. Specifically, these are analysis of total phosphate, chloride, BOD and COD. A significant fraction of the total phosphate in solution appears to be of a refractory nature and has thus required strict adherence to the digestion sequence utilizing the sulfuric acid-nitric acid digestion sequence (APHA, 1971, p. 525). Chloride analysis has been subject to considerable interference when colorimetric methods have been used. On undiluted leachate samples, it may on occasion be necessary to use a potentiometric titration technique.

BOD/COD determinations of leachates cannot be expected to exhibit the precision usually attributed to them due to the complexity of the solutions. Among the many factors which could contribute to this lack of precision are the following: (1) high toxicity in some leachate samples causing a marked depression of the BOD values; (2) high levels of halogens in the leachate may have resulted in inadequate levels of mercuric sulfate being added, thus giving high COD values due to oxidation of chlorides to chlorine; (3) certain low to moderate molecular weight fatty acids are not oxidized by the COD methodology unless high levels of silver sulphate catalyst are present; (4) ammonia will oxidize biologically but not be represented in the COD determination due to losses by volatilization. Considering the multitude of contributory factors and the fact that BOD values are frequently close to those for COD, one would expect on a statistical basis,

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that BOD:COD ratios might occasionally occur that would be greater than one. These inversions have indeed been observed, primarily in the more recent determinations for Cell C. (See tabulated data in Appendix H).

Total Suspended Solids

Analytical measurement of total suspended solids (TSS) in leachate samples is subject to possible error because of the oxidation of reduced iron and manganese and the subsequent precipitation of ferric hydroxide and manganese dioxide in the sample. Depending upon the sequence of sampling and the care of analyses, experience has shown that an inordinate variation in measured total suspended solids (TSS) results (See tabulated data in Appendix H). Our experience has shown that when proper care is taken to avoid the formation of precipitate in the sample, that TSS is generally low (50 ppm).

Considering that great care must be taken at all points in the handling of the sample to avoid introduction of oxygen prior to measurement of TSS and also that the data are marginal in terms of interpretive value, measurement of TSS in leachate is not recommended and was discontinued prior to the third year of this study.

Color

Quantitative measurement of color is useful only to the extent that it measures the relative intensity of this parameter and may be correlatable with other more meaningful measurements. Since even slight turbidity (suspended solids) causes the apparent color to be noticeably higher than the true color, it is necessary to remove suspended material before true color can be approximated. Removal of suspended solids is normally done by centrifugation.

Measurement of color in leachate samples is somewhat complicated by the fact that diffusion of oxygen into the leachate sample causes the oxidation of reduced Fe and Mn solution species, and, hence, the precipitation of the hydroxide and dioxide, respectively. The formation of small, colloidal solids interferes with the color measurement, and due to the high concentration of reduced iron (and probably Mn) in solution, it is necessary to either (1) prevent oxidation and precipitation from occurring, or (2) allow complete oxidation and precipitation to occur and remove the precipitate by centrifugation.

The first procedure, preventing diffusion of oxygen into the sample, requires care in handling of the sample at all points of transfer prior to analysis. The second procedure is more time consuming than the first and may still result in very small colloidal particles remaining in solution despite centrifugation. Given the limited value of the color measurements to begin with and the handling problems discussed above, measurement of color in leachate is not recommended and was discontinued during the second year of this study.

Electro-Conductivity Ratios

A review of leachate quality (both from literature and this study) shows a wide variation in concentrations of measured constituents running over several orders of magnitude. Consequently there are typically problems of dilution associated with analytical determination of most chemical constituents.

Selection of the degree of dilution required for various analytical tests is complicated by the changing nature of leachate as a function of time and site. Since electro-conductivity (EC) is essentially a measure of the concentration of dissolved ions in solution, there is a strong possibility that a correlation between EC and major ionic species can be made. The correlation between EC and other chemical parameters has therefore been investigated as a possible aid in predicting a proper dilution ratio.

Results utilizing the available data indicate the EC ratios may prove of value in estimating dilution requirements for some parameters. Ratio data for leachate from Cells C and D are presented in Tables 6 and 7. Especially good correlation is found between EC and alkalinity, BOD, COD, Na and K. Somewhat greater scatter is seen for the data on calcium and magnesium. The large standard deviation in data on sulfate is expected since SO_4 is a reactive compound under reducing conditions and hence should not be expected to follow EC values consistently, although EC/SO_4^{-2} ratios should increase as SO_4 is reduced to sulfide.

Except for magnesium and sulfate, the EC ratios for Cells C and D are surprisingly close. This indicates that, at least for these few parameters, EC ratios can be used effectively in estimating concentrations for dilution in the laboratory. This may be especially useful in cases where spot samples are brought in for analysis with no prior information on the leachate composition.

Typically, there is less than a factor of two variation in the range of EC/parameter ratios for alkalinity, calcium, chloride, magnesium, potassium, sodium, and TDS (see 18-week averages in Tables 6 and 7). Considering the variation in absolute concentrations of several orders of magnitude, it appears that there is considerable merit in the use of EC/parameter ratios for predicting dilution ratios.

Of special interest is the fact that EC/BOD and EC/COD ratios increased by almost an order of magnitude in Cell D when vigorous methane fermentation began and when pH increased (12/73 on), indicating that BOD and COD dropped dramatically in absolute value, while general concentrations of electrolytes remained high. In contrast, EC/BOD and EC/COD ratios for Cell C (Table 6) remained extremely stable, varying less than a factor of two over the whole test period (for Cell C: EC/BOD mean of 0.42± 0.15, EC/COD mean of 0.31± 0.09, and for Cell D: EC/BOD mean of 0.45± 0.12, EC/COD mean of 0.33± 0.10).

Gas Analyzer

In addition to its use as a pump to withdraw gas samples from the gas probes, the gas analyzer also registers explosibility of the gas.

Although the value registered is not used to determine precise percentages of gases present, the instrument can be used to detect the presence of combustible gases in air.

Thermistors

In order to establish that thermistors installed within the gas probe conduits register temperature representative of the refuse at that location thermistors were installed both inside and outside the top gas probe in Cell B. No appreciable difference in temperature was registered by the thermistors. The comparative data is presented in Table 8.

Gas Sampling

The initial gas samples obtained 12/8/71 were collected in large evacuated sample bottles and are considered to be uncontaminated samples. These test results are therefore reliable. Samples taken between 1/3/72 and 3/14/72 were collected utilizing a flushing technique which resulted in collection of samples contaminated with atmospheric air. Subsequent modification of the sampling technique to include evacuation of the sample bottle eliminated this problem. Test results commencing 3/28/72 are considered representative of the gas produced in the refuse cells.

TEST CELLS: TREATMENT, PURPOSE AND RESULTS

Variability of Leachate Composition

The number of studies on leachate derived from sanitary landfills is increasing rapidly. Table 2 provides a summary of ranges reported for parameters measured on leachates. Tables 9 and 10 summarize the conditions under which the laboratory and field studies were conducted to allow some comparison with the study presented in this report. The range of values for the parameters listed in Table 2 indicate a significant variation from site to site as well as wide variations over time at any given site. As described earlier, the five test cells utilized in this study were managed in different ways in order to evaluate the effects of the various operational modes. Discussion of the results obtained from the test cells follows, beginning with a short discussion of the reactivity of cell construction materials.

Reactivity of Cell Construction Materials

In order to establish if percolation of additive water and leachate was appreciably changed in quality due to solution of the granular materials utilized to distribute the liquids over Cells C and D, 20 gram samples of material were placed in distilled water in 300 ml. BOD bottles. Four sample bottles were prepared for each of the three granular materials. A schedule was established to test the water at time intervals of one week, six months, one year, and two years, respectively. The tests include pH, alkalinity, Na, K, Ca, Mg, and electrical conductivity determinations.

Test results (Table 11) indicate that only insignificant quantities of dissolved materials are contributed by the granular materials used in the test cells. The general composition of water in continual contact with the granular materials appears to be relatively stable in each case except for pH. The test bottles were exposed to sunlight during the latter part of the test, allowing algal growths to develop. Consequently, the decreasing alkalinity, calcium and magnesium probably reflect biological activity rather than some chemical process. The silty sand, concrete sand and pea gravel all exhibit about the same solution characteristics, none of which indicate any substantial contribution to the leachate composition.

Cell A - Control Test Cell

Cell A was constructed in accordance with normal sanitary landfill practice and covered after the cell was filled with refuse with no artificial addition of moisture. A total of 530.35 tons of refuse (997 yd.^{3}) were placed, giving an average density after compaction of about 1064 lb./yd.^{3} The average initial moisture content (percent wet weight) was 28.4 percent (Table 12).

Leachate and Gas Composition: The first significant quantity of leachate was collected from Cell A in October 1972. During this period the first rainfall of the winter was recorded. Prior to the rains the soil cover exhibited numerous random shrinkage cracks. Apparently a considerable volume of storm water infiltrated Cell A (see Figure 30) before the clay cover swelled, sealing the cracks. It is obvious that the volume of leachate produced by Cell A as of May, 1974 is significantly less than for either Cell B or E.

Data for leachate samples for Cell A prior to November 1972 indicate, in general, very low values for the compositional parameters when compared with leachate from other test cells. These low values prior to November 1972 may indicate that the initial leachate samples were condensate and, hence, did not carry the normal load of dissolved and suspended materials found in leachate. The volume of leachate collected prior to September 1972 also supports this hypothesis (Appendix H). In particular, highly soluble electrolytes such as K, Na and Cl were found in low concentration until after heavy winter rains produced a significant quantity of leachate (Figure 30). Parameters showing marked increase after November 1972 are EC, TDS, Ca, Mg, SO_4, volatile acids and alkalinity. The pH remained at about 5.0 as expected because of the high partial pressure of carbon dioxide. As a consequence of the limited data little can be said about the activity within Cell A prior to October 1972, after which time production of leachate allowed consistent monitoring. Settlement data, presented in Figure 41, indicate that little settling occurred before the 1972-73 winter rains. In fact, a settlement deflection occurred between September and November 1972 commensurate with early heavy winter rains. Apparently, compaction within the cell occurred due to an increase in total weight caused by infiltrating water.

Following the winter rains of 1973-74, a significant volume of leachate was produced (Figure 30) and compositional data indicate general reducing conditions with a pH of about 5.0 and steadily increasing concentrations of most chemical constituents. This general trend can be explained almost totally on the basis of the increasing quantities of water finding its way into the test cell, thus allowing more vigorous microbial activity as well as increased opportunity for solubilization of many constituents.

Although initial levels of both phosphorus (P) and nitrogen (N) were somewhat low in comparison to nutrient content in other leachates, they were sufficient for biological activity and, as can be seen in Figures 18, 19, 20 and 21, the nutrients increased in concentration as increasing quantities of leachate were produced. Biodegradation of organic material is proceeding as evidenced by the high concentration of CO_2 (large partial pressure) and the increase in volatile acids. Methane has been measured (Figure 40) in low concentration (1% by volume), indicating the presence of methanogenic organisms, even though conditions in the cell are far from optimal.(low pH ~5.0, high volatile acids).

Trace metals data (Table 13) indicate that Cd was consistently below the detection limits for the analytical methods used prior to January 1974. Since the 1962 U.S. Public Health Service Drinking Water Standard of 0.01 ppm for Cd is below the detection limit of the analytical method employed, nothing can be said concerning Cd as a potential hazard relative to the Drinking Water Standards except for the last three data points, all of which are above USPHS Standards. Cu has been found (Table 13) in the 0.1 - 1.0 ppm range, but is generally below the USPHS Standards (1.0 ppm). Zn, Pb and Hg, however, appear to be consistently present in the leachate in quantities above or near the Drinking Water Standards (USPHS Standards: Zn-5 ppm, Pb-50 ppb, Hg-5 ppb). An analysis of the potential for contamination of groundwater by these metals must take into consideration the likely reactions between the leachate and the soil through which the leachate must pass to enter the groundwater aquifer and potential removal mechanisms such as ion exchange, adsorption and precipitation.

General trends for soluble electrolytes such as Cl, Na, K, Mg and Ca correlate well with similar increasing trends for total dissolved solids (Figure 14) and electro-conductivity values (Figure 15). Increasing concentration of sulfate (Figure 17) indicates that the general reducing environment is not severe enough to use sulfate as the electron acceptor in microbial metabolism and hence the internal environment is apparently not generally suitable for vigorous methane production.

Cell B - Field Capacity Test Cell

Cell B is different from Cell A only in the respect that 41,000 gallons of water were added to bring the cell up to field capacity before the cover material was placed. A total of 524.23 tons of refuse (997 yd ^{3}) were placed, giving an average density after compaction of about 1052 lb/yd ^{3}. The average initial moisture content (percent wet weight) was 27.3 percent. The added water brought the moisture content up to 45.2 percent at field capacity (Table 12).

Leachate and Gas Composition: The initial addition of moisture to Cell B was intended to bring the refuse moisture content to field capacity, thus allowing any subsequent addition of water to generate a nearly proportionate amount of leachate. The cumulative record of leachate production for Cell B (Figure 30) shows the increase in leachate production resulting from early winter rains (9/72 - 11/72). The short duration of increased leachate production suggests that open cracks in the soil cover were apparently sealed due to swelling, once the cover material was saturated with moisture. Apparently, infiltration was relatively significant prior to the natural sealing of the cell cover material. Data for cumulative leachate production (figure 30) show only a minor volume of leachate produced during the 1973-74 winter period, immediately after the first heavy rainfall, again indicating an infiltration - sealing sequence. This is in direct contrast to Cell E, which produced a large volume of leachate during the same time period. On the other hand, Cell A leachate volume during the 1973-74 winter period was almost negligible.

Data on leachate composition must be separated into two time periods. The first is the period from 12/71 immediately after Cell B was brought to field capacity and the onset of the winter rains in October 1972. The second period covers the time interval starting with the winter rains of 1972-73 (10/72 on). Nothing significant can be said about data developed during the earlier period. This first set of data are scattered and generally reflect concentrations of components in leachates in the ranges reported in literature.

Leachate composition data for the second time period reflect real changes and can be explained in terms of volume flow-through and biological activity within the cell. Generally speaking, it can be said that there continues to be anaerobic biodegradation within the cell, and changes in gas composition (Figure 40) as of winter 1973-74 mark the beginning of significant methane production. This production of methane is in sharp contrast with normal indicator parameters such as pH and volatile acids (Figures 26 and 11). Ph remains low (5) and volatile acids remain high (15,000 mg/l). However, a similar response was noted in Cell C where significant methane production occurred (7/72 - 12/72), while pH remained low and volatile acids high. This is easily explained by the heterogeneous nature of the landfill environment, where many microenvironments may exist simultaneiously. Apparently, general conditions within the cell necessary for sulfate reduction have not developed, as is evidenced by continued high SO_4 concentrations (Figure 17).

Trends from October 1972 on, for all parameters (except pH and P) indicate a possible dilution mechanism acting to lower concentrations during periods of significant infiltration. The decreases in concentration for most parameters coincides with periods of heavy winter rains (10/72 - 3/73 and 11/73 - 3/74). This is especially evident in trends for TDS and EC, both of which reflect decreasing concentrations with time (Figures 14 and 15). Na, K, Ca, Mg, and Cl, as well as volatile acids, alkalinity, BOD, COD, and organic nitrogen and ammonia (Figures 10 through 25) all reflect decreases in concentration commensurate with increases in total volume of leachate produced (Figure 30).

Thermal response of Cell B shows trends consistent with literature data on thermal response of soil gases (see section on Thermal Response for more complete discussion).

Trace metals data (Table 13) show compositions for Cell B similar to those for Cell A. Again, Zn, Pb and Hg tend to be at or above the USPHS Standards, while Cu generally is below 1 ppm (except on 1/3/72) Cd has been detected regularly and is typically well above the accepted USPHS Drinking Water Standard.

The data for Cell B can be interpreted in terms of several parallel ongoing processes The general upward trend of concentrations in between periods of dilution due to infiltration water indicates ongoing decomposition processes leading to release of soluble materials, especially inorganic salts. Although the increased moisture content during periods of infiltration initially tends to act as a dilutant, the secondary effect would be to stimulate microbial activity (Alexander 1971), thus leading to increased release of more soluble materials.

The rate of settlement for Cell B is quite similar to the rate of settlement for Cells A and E (Figure 41), even though leachate production has been somewhat different.

Cell C - Continuous Flow-Through Test Cell

Cell C contains a total of 521.72 tons of refuse with an average initial density after compaction of 1064 lb/yd^3. The average initial moisture content (percent wet weight) was 25.6 percent (Table 12). The moisture content (percent total weight) at field capacity was estimated to be near 60 percent (assuming about 50 percent porosity for placed material after compaction). Water was applied to Cell C at a rate of approximately 700 gallons per day. The general effects of this mode of operation are discussed below.

Leachate generated by this cell is disposed of by injection into a well in the adjacent County sanitary landfill.

Leachate and Gas Composition: General time responses for leachate composition parameters indicate decreasing concentrations for all parameters (except pH). This general decrease reflects the basic flushing action of the water added to the cell in parallel with ongoing anaerobic biodegradation of the fill materials. The rate of addition of water to Cell C was designed to 0.4 gal/ft^2/day. Figure 31 presents the cumulative distribution and collection of liquid for Cell C. The slope of the distribution curve is 19.35 x 10^3 gal/month, or 0.314 gal/ft^2/day, slightly under the design capacity. The slope of the cumulative volume collected from Cell C is 15.86 x 10^3 gal/month, or 0.22 gal/ft^2/day, an average loss of about 18 percent, which can be attributed basically to evapotranspiration.

The continuous steady application of water to Cell C has resulted in a moderation of the thermal response of the upper layers in the cell as is reflected in Figure 38. This thermal response is different for Cells A, B and E, and more closely resembles the thermal response of Cell D, where continuous recycle of liquid also seems to be reflected in a stable temperature profile through the depth of the cell (Figures 35-39). A more detailed discussion of thermal response is given on page 27.

Trends in the data for gas composition, alkalinity, volatile acids, BOD, COD, organic and ammonia nitrogen, and sulfate all indicate vigorous anaerobic microbial activity within the cell. In spite of the low pH (Ca. 5.0) methane is being produced at increasing rates (Figure 40). The decrease in SO_4 from earlier levels indicates that sufficient reducing conditions exist for the reduction of sulfate to sulfide in the general environment (sulfate acting as an electron acceptor). The apparent contradiction of low pH and significant methane production can be explained directly on the basis of variations in local environments (so-called microenvironments). Because of the dissimilarities in the physical and chemical determinants in a heterogeneous environment and the consequent establishment of somewhat distinct microbial communities in the spatially separate microhabitats, one population may be subjected to diverse stresses in the adjoining microenvironments. Thus, knowing that appropriate conditions can exist in localized regions within the cell, it is quite normal for vigorous activity of methanogenic organisms to occur in what might otherwise appear unfavorable conditions.

The vigor of the biodegradation processes is reflected in the increasing percentage of NH_3 - nitrogen and decreasing percentage of organic nitrogen (Figures 20 and 21). The strength of the reducing conditions is reflected by the low level of NO_3 (figure 19) and the smooth decrease of SO_4 (Figure 17). Sulfate, a strong anionic electrolyte under oxidizing conditions, would typically follow the same trends as Cl (Figure 16) which generally functions as a quasi-conservative material. However, under appropriate reducing conditions, sulfate is utilized as an electron acceptor and is reduced to sulfide during bio-oxidation of organic matter. The presence of CH_4 and decreasing SO_4 indicates strong reducing conditions.

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Nutrient concentrations (P and N) indicate that sufficient quantities of nitrogen and phosphorus are available for biological growth. After almost three years of continual flushing, total phosphate remains about 5-10 mg/l, substantially above minimal nutrient requirements for most organisms. It appears that the flushing action will continue to remove nutrients from the cell and may eventually lead to nutrient limited biological activity, depending upon the availability of organic substates as well. Ammonia nitrogen is decreasing, but at 50-100 mg/l still remains far in excess of nutritional requirements for most anaerobic micro-organisms. It appears from present trends, that macro and micronutrients are being depleted and/or removed at comparable rates.

The quantity of oxygen contained in the water added to Cell C may eventually affect the general composition of the leached liquid, but at the present time, it appears not to be exerting a strong influence. There is the possibility that added water with substantial O_2 concentration could be toxic to the anaerobic organisms present in the landfill. It is also likely that the oxygen would be consumed rather rapidly as the water moves through the cell depth and, hence, only the upper layer would be affected. This toxic behavior of oxygen would be reflected in the gas composition, generally causing a lower production of methane since molecular oxygen is known to be extremely toxic to methanogenic organisms.

Concentrations of dissolved materials and electrolytes as reflected by the gross measurement parameters TDS and EC (Figures 14 and 15) show a rather smooth trend toward lower concentrations. Specific parameters such as Na, K, Ca, Mg and Cl reflect the same trends. The decreasing concentrations are compatible with vigorous biodegradation since inorganic salts and refractory organic solutes are expected end products of the bio-oxidation process and should be easily washed out. The early data (first 6 months) showing high concentrations of electrolytes should reflect the flushing out of readily solubilized material, leaving behind those materials requiring biodegradation.

Trace heavy metals data (Table 14) indicate that, except for Cd, all metals monitored are present in substantial quantities. The concentrations of these metals are high but compatible with a low pH and the presence of dissolved organic solutes which can act as chelating agents. Except for Zn, no trends are apparent. Zn concentrations are decreasing with time, indicating a flushing action. Zn, Pb and Hg are all high when compared to USPHS Drinking Water Standards and pose a potential pollutional hazard to groundwater and surface water sources. Recognition of the potential hazard is important.

The rate of settlement of Cell C (Figure 41) is more rapid than the rate of settlement for Cell A, B, and E. Cell C has had continual throughput of water and the data indicate accelerated compaction compared to control Cell A. Settling behavior of Cell C is similar to Cell D. Similar observations were made by Mao and Pohland (1973) on the rate of settling of simulated landfills where leachate was recirculated.

The presence of polychlorinated biphenyls (PCB) was detected on 3/2/72 at an 0.35 ppb level and 0.40 ppb on 3/28/72. However, none has been detected in subsequent analyses. Since there is no experience to allow prediction of time-concentration response for PCB's under the conditions present in the test cell, further monitoring of this parameter was justified at a reduced frequency. It should be noted that in the process of analyzing for PCB's, other chlorinated hydrocarbons have been detected. Specifically, Lindane was found at the 0.06 ppb level on 12/28/71. No systematic appearance of chlorinated hydrocarbon pesticides is evident and hence does not appear to be a major concern in this study.

The concentration of fecal coliform and fecal streptococci (Figure 28 and 29) indicate a gradual die-off of these organisms in Cell C, similar to observations in other cells. It was expected that natural competition and inhibition processes would cause a reduction in the active organism level as has been observed.

Cell D - Continuous Leachate Recycle Test Cell

Cell D contains a total of 530.07 tons of refuse with an average initial density after compaction of 1065 lb/yd^3. The average initial moisture content (percent bulk weight) was 22.7 percent (Table 12). After saturation, it is estimated that moisture content (percent total weight) is near 60 percent (assuming about 50 percent porosity for placed material after compaction). Leachate is recycled and redistributed to Cell D at the rate of about 1,000 gallons per day. The time response of leachate and gas composition are discussed below for this mode of operation.

Leachate and Gas Composition: The fluid routing for Cell D over the test period is presented in Figure 33. It is evident that the volume of recycled leachate has deviated by at least a factor of 10 during the test to date.

Infiltrated rainwater added to the volume of leachate developed during the heavy winter rains of 1972-73 and 1973-74 (Figure 32), with the total volume of infiltrated water being significantly less during winter 1973-74. The daily volume of recycled leachate varied from a low of about 500 gal/day (3500 gal/week) to a high of about 5,000 gal/day (37,000 gal/ week). The surface loading rates for these daily volumes are 0.2 gal/ft^2 / day and 2 gal/ft^2 / day, respectively. Data on leachate composition indicate surprisingly stable concentration conditions during the transition periods from low flow to high flow, where one might expect an apparent dilution effect.

Na, K, Ca, and Mg show an initial leveling trend indicating that some control mechanisms may be operating on these alkali and alkaline earth metals during the early time period. These four metals, usually quite soluble (at low to neutral pH values for CA and Mg), show no major response to changes in leachate volume during the periods 10/72 to 3/73 and 2/74 to 4/74. TDS and, to some extent EC, also show a leveling trend commensurate with the data for Na, K, Ca, Mg, as well as Cl and alkalinity. The gradual decline in concentration of these parameters as shown in Figures 22-25 indicates that removal processes of some sort are acting to reduce the total mass remaining in solution. The most probable mechanism for Ca and Mg is precipitation of some form of calcium-magnesium carbonate, especially after May 1973 when pH increased to 6.5 (Stumm and Morgan, 1970). A sample calculation for soluble calcium in equilibrium with solid calcium carbonate (calcite polymorph) and in the presence of 4000 mg/l carbonate alkalinity at pH 6.5 gives a value of about 125 mg/l Ca^{+2} (using an activity coefficient of 0.2). Now, knowing that a calcium-magnesium carbonate would be more soluble than calcite (by at least a factor of 2) and assuming considerable complexing of calcium in solution by organic chelates, it is interesting to note that the calcium remaining in solution in March-April 1974 is about what one would predict by this mechanism (~300 mg/l predicted, 350 mg/l actual). Additional possibilities, but less probable, are adsorption and ion exchange, neither of which could reasonably account for the mass of Ca and Mg removed from solution in the recycled leachate.

Continuous recycling of leachate in Cell D has moderated the thermal response of the upper layers in the cell as reflected in Figure 39. A more detailed discussion is presented earlier in the report.

Active anaerobic biological activity is suggested by data on gas composition, volatile acids and alkalinity. The production of CH_4 increased sharply during the summer of 1972 and has continued at 50% by volume since September 1972. These data suggest strongly that conditions within the cell were accommodating methanogenic organisms even when low pH was measured in the collected leachate before August 1973. Thus, low pH in collected leachate cannot necessarily be used as a criteria for viability of the pH-sensitive methanogenic organisms. As mentioned earlier in discussion of Cells B and C and in the general summary to follow, microenvironments are the rule rather than the exception, especially in heterogeneous media found in refuse. The strong reducing conditions within the cell are reflected in the absence of any substantial nitrate (Figure 19), in the apparent reduction of sulfate (Figure 17) and in the high values for soluble reduced iron (Figure 27).

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The substantial reduction of soluble iron occurring after August, 1973 corresponds to the period of increasing pH and increased microbial metabolic activity. Thus, the reduction may be due to microbial utilization as a nutrient. Both NO_3 and SO_4 are utilized, sequentially, as electron acceptors during bio-oxidation of organic material under strong reducing conditions. The increasing percentage of ammonia compared to total nitrogen indicates a more complete degradation of organic matter. Substantial quantities of organic matter apparently accumulated in the leachate as is reflected in the relatively stable BOD and COD measurements (Figures 12 and 13) in the period up to June, 1973.

The relatively high values for organic and ammonia nitrogen and the concentration of phosphate indicate that these nutrients are not limiting to biological growth. The reduction in phosphate concentration with time may be indicative of bio-utilization of phosphate. Alternatively, precipitation of a calcium and/or magnesium solid phase (such as a calcium apatite) may be controlling the concentration of inorganic phosphate.

A balance of the major ions in solution can account for most of the TDS, but the leachate solution is sufficiently complex that it is doubtful whether any useful information can be gained by attempting a mass balance on the measured ions and a comparison with TDS.

Heavy metals appear to be accumulating in the recycled leachate. Inspection of values in Table 15 for Cu, Zn, Hg, and Pb indicate a rather steady concentration pattern with time. Cd does not follow this pattern within the detection limits of the technique used. Cu has accumulated to about 0.1 - 0.2 ppm levels, below the USPHS drinking Water Standards. Zn (Ca 20 ppm), Hg (Ca 10 ppb), and Pb (Ca 0.2-0.4 ppm) all are substantially above the USPHS Standards for these metals. The high organic content and low pH of the leachate solution are compatible with the rather high levels of trace metals prior to the increase in pH (Ca 8/73). This is especially true for Zn. The decrease in Zn concentrations correlate well with increased pH values which reflects the hydrolytic and solubility behavior of zinc. Comparison of heavy metals data collected for Cell D with data from other leachates (Table 2) shows a general correspondence in ranges of values observed.

The rate of settlement of Cell D (Figure 41) is very similar to the settlement rate for Cell C, both of which have a continual throughput of liquid. The settlement indicates compaction and is consistent with the apparent biodegradation occurring in both Cells C and D. The increased magnitude in Cell D as compared with Cell C probably represents the increased stabilization reflected by high methanogenic activity. The maximum settlement to May, 1974 reached a magnitude of approximately 6 inches, or about 7 percent of the refuse thickness. This rate of settling is similar to data for simulated landfills (Mao and Pohland, 1973).

Polychlorinated biphenyls were detected once on 3/28/72 at the 0.2 ppb level. No subsequent analysis showed any PCB's to be present. Lindane, a chlorinated hydrocarbon pesticide, was detected at the 0.07 ppb level on 1/18/72. No subsequent analysis shows evidence for the presence of pesticides. Apparently most materials of this nature have been either degraded or are being retained within the cell and are not in the leachate at detectable levels.

Data for fecal coliform and fecal strep (Figures 28 and 29) indicate that there has been a gradual, but steady kill-off of these organisms for all cells, including Cells C and D. The data confirm the expected results of microbial competition and adaptation. The only surprising development is the fact that there is such little difference between Cell E and Cells C and D. Cell E, seeded with septic tank pumpings, might reasonably be expected to have substantially more fecal organisms than leachates from other cells.

The general behavior of leachate and gas composition for Cell D reflects the general increased rate of biological stabilization of the organic fraction of the fill refuse. Although the data of Mao and Pohland (1973) show a much more rapid rate of refuse stabilization, the general trends are very similar and kinetic differences can be explained simply on the basis of toxicity and generally more concentrated leachate components. Additional explanations may be possible, but it is more important to recognize the similarities than to explain the differences. In fact, the data generated by this study are consistent with and complimentary to those provided by the study of Mao and Pohland (1973).

Cell E - Biologically Seeded Test Cell

Cell E was seeded with septic tank pumpings (27,200 gallons) to provide microbial seed material to accelerate biological degradation processes, and also to bring moisture content up to field capacity. A total of 521.93 tons of refuse were placed, giving an average initial density after compaction of about 1047 lb/yd^3. The average initial moisture content (percent wet weight) was 23.5 percent. The added septic tank pumpings brought the moisture content up to 37.2 percent, approximately at field capacity (Table 12). No additional management procedures have been used on Cell E.

Leachate and Gas Composition: Only small volumes of leachate were produced in Cell E prior to October, 1972. However, much the same as for Cells A and B, Cell E has responded to precipitation during 1972-73 and 1973-74 winters by producing some measurable quantity of leachate (Figure 30). The cumulative leachate volume (Figure 30) for Cell E has a time response somewhat different from Cells A and B during winter 1972-73. It is not understood at present why the time response is so different during this period. Data for Cell E shows a slow, smooth increase in leachate production during the heavy winter rains only tapering off after the precipitation of February, 1973. The most plausible explanation for these data is that the top soil cover of Cell E has a higher permeability compared to Cells A and B. A higher permeability would allow slow but continuous infiltration of rainwater into the cell and would not necessarily exhibit surface cracks. The less permeable soil with cracks would allow an immediate infiltration of rainfall, but once closed by swelling, it would be relatively impervious. The data cannot be explained by other differences in cell preparation and maintenance. The time response for leachate production after 6/73 shows similar behavior in Cells A, B, and E.

The general trend of all parameters for Cell E (except pH) appears to be toward increasing concentration, in most cases stabilizing at extremely high concentrations. For example, volatile acids (Ca 20,000 mg/l), BOD (Ca 40,000 mg/l), COD (Ca 60,000 mg/l), TDS (Ca 30,000 mg/l), Cl (Ca 3,000 mg/l), sulfate (Ca 1500 mg/l). Initial pH values were around 6.0 and considered along with early gas composition and volatile acid data it is apparent that biodegradation of organic matter was accelerated due to the seeding with septic tank pumpings. However, it now appears that the early biological activity may have been at the expense of easily decomposable material, since data collected since October, 1972 indicate increasing volatile acids, alkalinity, BOD and COD (Figures 10-13) with a corresponding decrease in pH to about 5 (Figure 26). A similar response to seeding was experienced by Mao and Pohland (1973) in their study of simulated landfills. Their discussion suggested that accelerated acid fermentation may overwhelm the buffer capacity of the system leading to suppression of methane formers.

The increasing concentration of readily soluble salts such as Na, K, Ca, Mg, and Cl (Figures 16, 23-25) is reflected by parallel increases in TDS and EC over time (Figures 14 and 15). The general increase in concentration can best be explained as a leaching of readily solubilized materials made available by the early biodegradation of organic matter. This explanation is supported by the opposite response to infiltration water in Cell B which, while brought to field capacity the same as Cell E, did not have the microbial seed to accelerate the biological processes.

No substantial change is evident in the gas composition which remains with substantial percents of CO_2 (90%+) and measurable CH_4 (5%+). Although anaerobic, the cell environment apparently is not yet sufficiently reducing to convert sulfate to sulfide as is evidenced by increasing concentrations of SO_4 (Figure 17). Even though the rate of production of leachate is different between Cell E and Cells A and B, the rate of settlement for these three cells is quite similar (Figure 41). Cell B was brought to field capacity prior to sealing. Whereas Cell E was brought close to field capacity, Cell A was not moisture conditioned, but received relatively small quantities of rainwater during construction of the cell.

The P and N nutrient levels (Figures 18-21) in Cell E leachate indicate that neither nutrient can be considered limiting by normal biological requirements. Although the specific nutrient requirements of the anaerobic microorganisms existing in the cell are unknown, it is safe to say that the nitrogen and phosphorus available in the leachate are at least an order of magnitude above minimal requirements.

Heavy metal content of Cell E leachate (Table 13) follows the same trend as for Cells A and B. Cd is either just at or below the detection limits of the analytical methods used and, when detected, is above the USPHS Drinking Water Standards. Cu is generally found at levels below 0.2 ppm, while Zn, Pb, and Hg tend to be at or above the 1962 USPHS Standards.

GROUNDWATER QUALITY

One of the major concerns about sanitary landfills is the pollution potential of leachate and the possible contamination of adjacent surface water and groundwater. The purpose of monitoring the quality of groundwater in close proximity to the test cells and down valley from the cells is to maintain a check on the effectiveness of the earth cells in preventing leachate from contaminating the underlying groundwater.

The data collected to date (Appendix H) indicate that the quality of the groundwaters taken from test wells 1 through 4 remain stable in terms of the parameters most likely to indicate pollution by leachate. The parameters most likely to indicate the presence of leachate contamination are those relatively conservative parameters (from the point of view of groundwater) such as Cl, Na, K, Ca, Mg, SO_4, and alkalinity. In addition, gross measurements such as TDS and EC are also valuable indicators of changes in composition. The data collected show no significant shifts in composition of the water in any of the wells. The indications are that no contamination of the surrounding groundwater aquifer has occurred to date. Therefore, the clay liners are assumed to have maintained their integrity at this point in time. This conclusion is further supported by data on the quality of water extracted from the sub-cell lysimeters presented in Appendix H.

GENERAL SUMMARY OF REFUSE STABILIZATION

The use of landfilling as a means of disposing of solid wastes has been widely employed as an economical method of refuse disposal. Typically, the organic and inorganic constituents of the refuse are subject to microbial and chemical degradation and hence will leach as water percolates through the waste materials. Unless contained, the leachate may enter groundwater aquifers, surface streams, lakes or impoundments. Guidelines for land disposal of solid wastes generally include recommendations that the design consider potential leachate production and, thus, include a system for protection of ground and surface waters. The eventual appearance of leachate and gas problems at or near most landfill sites emphasizes the need to understand the refuse stabilization processes and the need to eventually control those processes.

The production of leachate and gases from sanitary landfills is a direct consequence of the unavoidable chemical-biological activity which must occur in the refuse materials. The only real question is one of the time dependency of major processes extant in the landfill

The most important overall processes are those involving the anaerobic microbial metabolism of the organic materials in the fill refuse. It was the purpose of the study reported herein to demonstrate methods by which stabilization of refuse components might be accelerated by deliberate managed techniques. It is useful to summarize here the general trends of sequences of refuse stabilization. Although the exact definition of the condition of a specific site and/or its pollution potential is not possible here, it is possible to describe the stages of stabilization on the basis of past experience with landfill leachate and gas composition, as well as the available literature information on anaerobic microbial decomposition processes.

A young site in a region of moderately heavy precipitation will generally accumulate moisture until it reaches field capacity (unless otherwise treated). As the initial anaerobic biodegradation processes occur the acid fermentation phase will predominate yielding leachate with a low pH, high volatile acids, considerable inorganic ions (eg., Cl^-, $SO_4^=$, Ca^{+2}, Mg^{+2}, Na^+) and a gas composition almost totally CO_2. This phase of stabilization reflects the fact that anaerobic biodegradation is a two-stage process. In the first stage the bacteria grow by utilizing anaerobic fermentation yielding organic solute products composed **mainly of** volatile fatty acids. The extent of this fermentation depends on the degree of anaerobiosis (degree to which O_2 is excluded). In this stage pH generally falls (because of the volatile fatty acids as well as the high partial pressure of CO_2) and CO_2 is the principal gaseous product. The principal energy sources consist of solutes such as starch, cellulose, hemicellulose and pectic residues, glycerol from lipids (probably small amounts), and any available polysaccharides and mucopolysaccharides. This fermentation is carried on by a varied flora and typically produces a mixture of volatile fatty acids, ethanol, CO_2 and H_2. Lignin-type aromatic compounds are probably not degraded to any extent anaerobically, since lignin degradation is an aerobic process, although there is the possibility of methanogenesis (in the second stage), as the aromatic ring in a benzoate can be degraded by methanogenic bacteria from sewage.

All these processes are carried out by a mixed anaerobic flora, many of them strict anaerobes. There are also facultative anaerobes present in varying numbers, and while these aid in the breakdown of materials, they are, most importantly, responsible for utilizing oxygen in solution, thus producing sufficiently low reducing conditions so that strict anaerobes can grow.

Methane fermentation is the second stage of the overall anaerobic process. The methanogenic bacteria are strict anaerobes and oxygen at any detectable level is extremely toxic to these organisms and will inhibit their growth. In general, methanogenic bacteria are slow-growing and have tight pH tolerances (6.6 - 7.4). Methanogenic bacteria, like other organisms utilizing nutrients of substrates whose availability is regulated by abiotic factors, present a special situation in regard to ecological amplitude. The availability of many soluble or insoluble nutrients, both organic and inorganic, changes as the level or intensity of these factors is modified; for example, pH regulates the extent of retention of numerous soluble nutrients while the redox potential determines whether or not several inorganic nutrient elements are in a form readily assimilated. These abiotic processes come in addition to the physiological tolerances of the various microbes themselves.

The nitrogen requirements of the methanogenic bacteria are not completely known. It seems that they can use NH_3 and possibly some amino acids. The substrates for methane formation by different species of methanogenic bacteria have been given as $H_2 + CO_2$, formic, acetic and butyric acids, ethanol and methanol. Hydrogen and CO_2 and formate are definitely substrates, but all the possible substrates for methanogenesis are probably present in leachates.

Methanogenesis is subject to substrate inhibition by high levels of volatile fatty acids and since methane bacteria are slow-growing, removal of volatile fatty acids by methane bacteria is often the rate limiting step in the anaerobic digestion process. Too rapid a primary fermentation results in accumulation of volatile fatty acids, the cessation of methane fermentation and a slow-down of the overall process. This was observed by Mao and Pohland (1973) in the simulated landfill which was seeded with sewage sludge and appears to have occurred in Cell E in this study.

It is fair to say that leachate and gas composition reflecting near neutral pH, low volatile acids, low total dissolved solids and high CH_4 content (50%) in the gas likely reflects older landfill sites which have already undergone substantial stabilization of the readily available organics in the refuse. The composition of leachate and gas from Cell D at the present time (June, 1974) reflects such a situation.

Although the activities and very existence of a microbial population are associated with a multitude of abiotic factors, a range (maximum and minimum) is usually established for each of these factors. These are physiological limits beyond which the microbial population is unable to maintain itself or to perform a vital function. For each factor an optimal level or range can usually be established, in addition to an upper limit. Thus, in a heterogeneous mixed media system such as is found in a landfill, it is to be expected that many environmental conditions co-exist in different places, leading to the formation of different microenvironments where quite different types of organisms may grow. Therefore, it is not surprising to find methane produced in a landfill which appears to have a leachate pH of 5 (even though methanogenic organisms cannot exist at pH 5). The reason this can occur is because there are pockets or regions (microenvironments) in the landfill where conditions allow these organisms to survive.

The level of moisture content has an important role in promoting refuse stabilization. It is not possible at this point to quantitatively state what an absolute minimum moisture content or optimum content might be, but generally speaking, the more moisture, the better (Alexander, 1971). Old literature data

(McKinney, 1962) suggests 60 percent moisture as a minimum, but additional evidence is needed before a judgement can be made for landfill situations.

Although the rate of biodegradation is affected by temperature, there is no possibility of controlling this parameter in any practical manner and it is not discussed here.

Data from this study and that of Mao and Pohland (1973) indicate that accelerated refuse stabilization occurs with recycled leachate, and data presented by Mao and Pohland show that artificial control of pH at near neutral values when recycling leachate will further accelerate the stabilization process.

CONCLUSIONS

1. Control Cell A shows time dependence of leachate and gas composition consistent with general behavior of typical sanitary landfills. This cell provides a comparative standard basis for the other four managed cells.

2. Adding moisture to raise moisture content to field capacity does accelerate stabilization processes to an observable degree,as evidenced by early production of methane. Bringing landfill materials to field capacity immediately after placement accelerates the development of leachate and presumably enhances biodegradation processes even though not observed during the duration of this study in terms of leachate quality. No increase in rate of settling of fill material was observed resulting from the addition of moisture.

3. Continual flow-through of water accelerates stabilization of refuse materials, flushes out soluble materials and increases the rate of settlement of fill material. The inorganic solutes and organic solutes are reduced at equivalent rates. Early production of methane occurs in this mode of operation. All measures of soluble leachate constituents are significantly reduced.

4. Continual flow-through mode of operation does not appear to be economically feasible due to the large quantity of leachate which would require handling.

5. Recirculation of leachate through a landfill material significantly increases the establishment of active anaerobic microbial population within the fill. The recirculation of leachate increases the rate of biological stabilization of the organic fraction of the refuse, as evidenced by large reductions in BOD and COD.

6. The initial and secondary rates of surface settlement of the landfill is greatly accelerated for the recycled leachate mode of operation. The ultimate settlement of the landfill is thereby achieved much quicker for the recycled mode.

7. Leachate recirculation essentially uses the landfill volume as a generally uncontrolled anaerobic digestor for effective anaerobic treatment of its own leachate.

8. Significant advantages can be gained by leachate recirculation in terms of leachate control, ultimate quality control of leachate and acceleration of time frame for alternate use of landfill sites.

9. Seeding of placed refuse with septic tank pumpings without additional management accelerates acid fermentation processes, thereby increasing establishment of anaerobic microbial activity, but ultimately appears to suppress development of vigorous methanogenic organisms. In the absence of pH control of leachate and recycling of leachate, seeding cannot be recommended as beneficial on the basis of this study.

10. Leachate recirculation is the most feasible and most beneficial of the management procedures utilized in this study with respect to rate of stabilization of refuse.

RECOMMENDATIONS FOR FURTHER STUDY

Following are a series of suggestions which would yield useful results and insights into specific areas of landfill stabilization behavior.

1. Continue low level monitoring of leachate quality parameters on all cells.

2. Initiate studies on the methodology of estimating and possibly predicting active landfill life during which significant amounts of pollutants are produced.

3. Utilize Cells A, B and D for studies on the rate of gas production, feasibility of effective gas recovery by pumping and estimating rate of gas diffusion through surface coverings.

4. Initiate a study of refuse stabilization of Cell E by means of leachate recirculation with pH control.

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TABLES

TABLE 1

LIQUID CONDITIONING AND PURPOSE OF CELLS

CELL DESIGNATION	INITIAL		OPERATION		PURPOSE OF CELL
	LIQUID CONDITIONING	LIQUID USED	DAILY LIQUID APPLICATION gal/day	LIQUID USED	
A	None	None	None	None	Control Cell
B	Field Capacity*	Water	None	None	To determine the effect of high initial water content on refuse stabilization.
C	None	None	700± (200-1000)**	Water	To determine the effect of continuous water through flow on leachate character.
D	None	None	1000± (500-1000)**	Recirculated Leachate	To determine the effect of continuous leachate recirculation on leachate character.
E	Field Capacity*	Septic Tank Pumpings	None	None	To determine the effect of high initial moisture content, using septic tank pumpings, on refuse stabilization.

* Field capacity is the condition when a sufficient quantity of fluid has been added to the refuse to cause a significant volume of leachate to be produced from the cell.

** Range of variation in daily application of fluid.

TABLE 2

SUMMARY OF TYPICAL RANGES FOR VARIOUS LEACHATE PARAMETERS

PARAMETER (mg/l unless otherwise noted)	LABORATORY STUDIES				FIELD STUDIES			THIS STUDY		
	CALIFORNIA (1)	W. VIRGINIA (2)	DREXEL (3)	GEORGIA TECH (4)	CALIFORNIA (5)	S. DAKOTA (6)	ILLINOIS (7)	CELL A	CELL C	CELL D
Acetic Acid				4,000-8,000						
Acidity		500-3,000		1,500-3,300						
Alkalinity	730-9,500	8,000-18,000		2,000-2,500	255-1,125	243	100-10,000	1,000-8,500	2,000-5,500	2,000-8,000
Aluminum							0.05-2.2			
Arsenic							0.1-6.9			
Barium							0.15-8.5			
Berylium							0.1			
BOD	81-33,100	9,000-30,000		40-130	0.6-59		50-50,000	12,000-31,000	4,000-28,000	400-33,000
Bromide							0.1-12			
Butyric Acid				500-2,500						
Cadmium							0.05			
Calcium	115-2,570	500-3,000			88-355		100-300	500-2,500	400-1,600	500-1,600
Chloride	98-2,350	500-2,000	200-2,000	100-350	72-865	5.84	25-1,500	500-2,000	200-2,000	1,000-2,000
Chromium							0.05-0.2			
COD			1,000-40,000	6,000-18,000			10-50,000	15,000-55,000	4,000-40,000	1,000-38,000
Copper			1-4.5				0.05	0.15-0.7	0.02-0.6	0.04-0.35
Cyanide							0.005-0.024			
Fluoride							0.05-0.89			
Hardness, Total (as $CaCO_3$)	650-8,120	5,000-12,000	1,000-5,000	1,000-5,000	305-1,175	302	100-10,000			
HBAS							0.02-0.5			
Hexane Solubles							0-350			
Iron, Ferrous	2.0-93				0-4.0					
Iron, Total	6.5-305	100-800	100-1,400	0.02-24.0	0.07		0.2-5,000	700-1,100	200-300	62-300
Lead							0.5-1.3	0.1-1.8	0.1-0.8	0.01-2.0
Magnesium	64-410	100-400			13-110		25-300	600-1,100	100-1,000	300-700
Manganese	0.05-1.66									
Nickel			0.01-0.8							
Nitrogen, Total		400-2,000	30-400				2.4-6.5			
Nitrogen, Ammonia	0.22-890	300-1,000		20-250	0.12-8.5			40-700	100-800	200-900
Nitrogen, Nitrate						9.8	0.1-1.5	0.1-1	0.1-9	0.1-9
Nitrogen, Organic	2.4-550	200-1,000	8-480	50-150	0-2.3			5-100	10-900	10-900
Pesticides (ppb)				100-800			5			
pH	5.6-7.6	5.3-6.3	5.0-8.0	7.0	6.85-7.78	7.31	6.5-8.5	4.5-5.2	4.4-5.3	4.5-6.6
Phosphate	0.16-29	20-120	1-130	1.0-7.0	0.01-1.6		0.5-7.0	1-15	1-40	1-40
Potassium	28-1,860	700-3,500			4.4-198	0.16	2-790	200-900	70-800	300-800
Propionic Acid				2,000-5,000						
Selenium							0.1-2.7			
Sodium	85-1,805	300-1,200	200-3,800		67-710	10.2	50-1,200	80-900	100-950	600-1,000
Solids, Total		18,000-50,000	5,000-40,000							
Solids, Dissolved							200-13,000	12,000-26,000	3,000-20,000	4,000-27,000
Solids, Suspended			5,000-25,000							
Solids, Volatile		10,000-28,000								
Sulphate	39-730	200-800	50-400		25-700		25-800	150-800	100-800	100-900
Tannin and Lignin		300-1,000								
TOC				3,000-5,000						
Valeric Acid				30-1,800						
Volatile Acids, Total								10,000-19,000	3,000-12,000	1,000-14,000
Zinc			1-120				0.05-40	0.2-60	0.6-42	1.12-95

REFERENCES: (1) State of California (1954)
(2) Quasim and Burchinal (1970)
(3) Fungaroli (1971)
(4) Mao and Pohland (1973)
(5) State of California (1954)
(6) Anderson and Dornbush (1966)
(7) Hughes, et. al. (1971)

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TABLE 3

REFUSE MOISTURE CONTENT SUMMARY

ITEM	MOISTURE CONTENT - % OF DRY WEIGHT					
	CELL					Average of All Cells
	A	B	C	D	E	
Food Waste	NO DATA AVAILABLE	151	133	118	122	131
Garden Waste		67	99	102	91	90
Paper		29	28	38	36	33
Plastic, Rubber, etc.		21	20	15	20	19
Textiles		38	28	28	25	30
Wood		13	17	22	18	17
Metals		6	7	4	4	5
Glass, Ceramic		1	1	0	1	1
Ash, Dirt, Rock		10	26	15	13	16
Fines		47	47	47	51	48
TOTAL Random Sample Combined Waste	41	40	38	31	33	37

NOTE: Samples oven dried at 105° Fahrenheit

TABLE 4

REFUSE COMPOSITION SUMMARY

ITEM	PERCENTAGE OF TOTAL WEIGHT					
	CELL					Average of All Cells
	A	B	C	D	E	
Food Waste	8.8	10.4	12.8	9.7	12.0	10.7
Garden Waste	10.8	11.1	5.8	7.4	17.0	10.4
Paper	35.5	44.5	42.4	45.3	35.2	40.6
Plastic, Rubber, etc.	4.2	5.2	5.1	4.7	4.0	4.6
Textiles	1.1	1.4	2.5	1.5	1.9	1.7
Wood	1.3	1.2	0.6	1.3	0.4	1.0
Metals	8.0	9.9	8.8	9.5	8.6	9.0
Glass, Ceramic	9.1	9.8	11.5	12.4	11.5	10.9
Ash, Rock, Dirt	5.8	1.0	3.6	1.0	2.8	2.8
Fines	15.4	5.5	6.9	7.2	6.5	8.3
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 5

COMPOSITION OF REFUSE

SOURCE OF REFUSE / ITEM	WEIGHT PERCENTAGE			
	SONOMA COUNTY TEST CELLS CALIFORNIA	*SANTA CLARA COUNTY (a) CALIFORNIA	*CITY OF BERKELEY (b) CALIFORNIA	**DR. POHLAND GA. INST. OF TECH.- GEORGIA
Food Waste	10.7	12.0	25.1	25.0
Garden Waste	10.4	9.0		0
Paper	40.6	50.0	44.5	50.0
Plastic, Rubber,	4.6	3.0	2.2	3.0
Textiles	1.7	2.0	1.1	5.0
Wood	1.0	2.0	-	1.0
Metals	9.0	8.0	8.7	4.0
Glass, Ceramic	10.9	7.0	11.3	7.0
Ash, Dirt, Rock	2.8	7.0	7.1	5.0
Fines	8.3			0
TOTAL	100.0	100.0	100.0	100.0

(a) Estimated breakdown of domestic waste. Assumes a per capita production of 8 pounds per day of which 44% is domestic refuse.

(b) Refuse segregated and weighed at Berkeley Waste Disposal Site. Percentage figures are average of seven loads from districts established by income level and type of dwelling unit.

* Reference: "Comprehensive Studies of Solid Waste Management" First and Second Annual Reports. C. G. Golueke & P. H. McGauhey. Public Health Service Pub. No. 2039, 1970.

** "Landfill Stabilization with Leachate Recycle" Frederick G. Pohland, 3rd Annual Environmental Engineering & Science Conference, March 5-6, 1973, Louisville, KY.

TABLE 6

CELL C LEACHATE
ELECTRO-CONDUCTIVITY/PARAMETER RATIOS

DATE	PARAMETER									
	ALKALINITY	BOD	CALCIUM	COD	CHLORIDE	MAGNESIUM	POTASSIUM	SODIUM	SULPHATE	TDS
1-18-72	2.01	0.45	9.17	0.33	9.17	14.47	-	-	-	0.72
2-15-72	2.10	0.42	9.17	0.28	9.82	22.00	-	-	12.50	0.57
3-2-72	2.25	0.37	6.25	0.31	9.09	18.18	11.83	10.53	-	0.54
3-14-72	2.53	0.44	11.36	0.41	11.79	30.49	-	-	15.24	0.69
3-28-72	2.11	0.44	10.00	0.33	9.90	22.22	-	-	-	0.61
4-11-72	2.22	0.44	7.50	0.32	10.23	20.00	10.75	12.86	20.09	0.67
4-25-72	2.53	0.55	9.50	0.39	11.05	21.11	-	-	-	0.79
5-9-72	2.53	0.52	11.22	0.41	13.58	27.50	14.67	13.75	24.55	0.91
5-23-72	2.38	0.41	11.08	0.40	13.17	44.32	-	-	-	0.79
6-6-72	2.78	0.56	9.52	0.49	17.54	45.45	17.86	18.18	29.41	0.99
6-20-72	3.08	0.54	11.43	0.39	15.09	40.00	-	-	-	0.87
7-11-72	1.70	0.42	10.42	0.32	15.63	34.09	15.63	15.76	-	0.80
7-25-72	1.89	0.71	12.00	0.43	17.56	37.50	18.95	15.38	-	0.96
8-8-72	2.61	0.54	11.59	0.41	16.98	28.63	15.87	19.21	-	0.96
8-23-72	2.69	0.66	11.48	0.41	16.67	36.08	-	-	-	0.96
9-7-72	1.76	0.60	10.53	0.37	18.58	37.97	17.65	19.23	45.80	0.88
9-20-72	1.97	0.66	10.70	0.40	11.30	41.22	-	-	-	0.85
10-11-72	3.01	0.57	12.73	0.42	14.74	36.36	21.54	16.67	-	0.84
10-24-72	3.33	0.70	12.00	0.43	19.46	40.00	20.00	12.68	-	0.91
11-8-72	3.65	0.38	8.93	0.32	7.69	30.12	14.71	14.71	-	0.73
11-21-72	2.56	0.38	8.04	0.28	14.52	14.06	16.67	13.64	-	0.69
11-30-72	3.41	0.54	11.54	0.43	21.13	41.10	22.22	18.75	52.63	0.98
12-19-72	2.84	0.38	9.32	0.34	10.04	-	17.50	16.67	-	0.80

TABLE 6 cont'd

CELL C LEACHATE
ELECTRO-CONDUCTIVITY/PARAMETER RATIOS

DATE	PARAMETER									
	ALKALINITY	BOD	CALCIUM	COD	CHLORIDE	MAGNESIUM	POTASSIUM	SODIUM	SULPHATE	TDS
1-10-73	2.81	0.51	9.95	0.41	18.97	46.61	26.70	22.00	-	0.88
1-23-73	2.68	0.40	8.75	0.32	19.09	17.50	18.83	13.82	-	0.81
2-6-73	1.53	0.28	6.04	0.24	5.51	25.00	13.30	11.15	-	0.55
2-27-73	2.24	0.34	6.06	0.26	8.15	23.40	16.50	12.13	-	0.61
3-13-73	2.30	0.50	7.93	0.34	18.59	37.76	22.24	15.90	30.72	0.79
3-27-73	1.40	0.23	5.18	0.22	7.51	21.15	13.33	9.32	-	0.48
4-10-73	0.95	0.17	3.12	0.13	7.32	13.89	7.89	5.95	-	0.30
4-24-73	1.43	0.21	4.87	0.18	6.44	19.90	12.34	8.55	-	0.41
5-15-73	1.51	0.30	4.93	0.20	7.48	21.59	14.84	7.42	33.93	0.46
6-5-73	1.63	0.35	5.76	0.24	7.06	26.66	-	-	-	0.56
6-26-73	1.30	0.25	5.69	0.21	12.35	23.84	16.66	9.07	32.54	0.49
7-17-73	1.19	0.19	5.45	0.19	10.67	18.82	17.86	7.17	-	0.42
8-7-73	2.33	0.41	7.93	0.33	26.42	35.00	25.45	12.73	-	0.62
8-29-73	1.69	0.27	6.38	0.23	14.29	24.44	-	-	-	0.48
9-18-73	1.50	0.25	5.24	0.22	16.80	27.63	19.09	12.65	29.17	0.56
10-9-73	1.06	0.25	5.00	0.21	14.40	22.50	-	-	-	0.50
10-30-73	1.93	0.39	6.75	0.29	20.77	32.93	34.62	15.00	-	0.72
11-20-73	1.47	0.28	5.50	0.21	4.74	20.00	15.38	-	-	0.46
12-11-73	0.57	0.26	4.67	0.19	1.07	21.43	6.67	8.15	11.36	0.42
1-4-74	0.73	0.49	4.98	0.24	3.39	24.39	-	-	-	0.52
1-22-74	0.59	0.17	2.49	0.12	1.37	12.78	9.49	6.71	-	0.34
2-12-74	0.90	0.44	7.61	0.30	1.13	27.16	-	-	-	0.71
3-6-74	2.02	-	12.45	-	15.31	27.27	39.47	19.48	-	1.06

TABLE 6 cont'd

CELL C LEACHATE
ELECTRO-CONDUCTIVITY/PARAMETER RATIOS

DATE	PARAMETER									
	ALKALINITY	BOD	CALCIUM	COD	CHLORIDE	MAGNESIUM	POTASSIUM	SODIUM	SULPHATE	TDS
3-28-74	0.89	-	12.14	-	17.35	19.43	-	-	-	0.96
4-17-74	2.61	0.73	10.63	0.43	4.35	41.72	45.33	26.15	16.75	1.07
			STATISTICAL SUMMARY OF DATA Mean Values for 18-Week Time Periods							
Period Averages										
1-18-72 to 4-11-72	2.20	0.43	8.91	0.33	10.00	21.23	11.29	11.70	15.94	0.63
4-25-72 to 7-11-72	2.50	0.50	10.53	0.40	14.34	35.41	16.05	15.90	26.98	0.86
7-25-72 to 10-11-72	2.32	0.62	11.51	0.41	15.97	36.29	18.48	17.62	45.80	0.91
10-24-72 to 1-10-73	3.10	0.48	9.96	0.37	15.30	34.38	19.63	16.41	52.63	0.83
1-23-73 to 4-10-73	1.85	0.32	6.18	0.25	11.03	23.12	15.35	11.38	30.72	0.59
4-24-73 to 8-7-73	1.57	0.29	5.77	0.23	11.74	24.30	17.45	8.99	33.19	0.49
8-29-73 to 12-11-73	1.37	0.28	5.59	0.23	11.97	24.83	18.94	11.93	20.27	0.52
1-4-74 to 4-17-74	1.29	0.46	8.38	0.27	7.15	25.46	31.43	17.45	16.75	0.78
			Mean Values and Standard Deviations for Total Study Period							
Data Points	48	46	48	46	48	47	33	32	13	48
Mean	2.03	0.42	8.35	0.31	12.19	27.99	18.54	13.79	27.28	0.70
Std. Dev.	±0.76	±0.15	±2.79	±0.09	±5.83	±9.33	±8.26	±4.78	±12.46	±0.20

TABLE 7

CELL D LEACHATE
ELECTRO-CONDUCTIVITY/PARAMETER RATIOS

DATE	PARAMETER									
	ALKALINITY	BOD	CALCIUM	COD	CHLORIDE	MAGNESIUM	POTASSIUM	SODIUM	SULPHATE	TDS
1-18-72	3.93	0.59	7.69	0.13	9.92	21.43	13.19	12.24	-	0.57
2-15-72	2.47	0.53	8.46	0.42	10.68	22.00	-	-	10.58	0.77
3-2-72	1.88	0.41	6.43	0.30	9.18	18.00	12.16	10.00	-	0.55
3-14-72	2.02	0.50	10.00	0.40	11.76	26.67	-	-	13.04	0.75
3-28-72	1.98	0.44	7.69	0.31	9.80	20.00	-	-	-	0.59
4-11-72	2.02	0.46	11.11	0.31	10.87	16.67	13.75	11.63	12.59	0.62
4-25-72	1.94	0.45	9.00	0.29	8.82	16.36	-	-	-	0.59
5-9-72	2.27	0.54	12.50	0.37	11.47	25.00	17.19	12.25	13.59	0.77
5-23-72	2.18	0.36	9.38	0.34	11.19	33.89	-	-	-	0.68
6-6-72	2.24	0.42	7.22	0.38	12.38	30.95	17.10	13.68	14.32	0.89
6-20-72	2.83	0.39	10.62	0.38	11.59	30.36	-	-	-	0.73
7-11-72	2.00	0.50	9.85	0.37	12.62	26.00	16.25	14.77	-	0.61
7-25-72	1.90	0.61	10.59	0.41	14.02	22.87	18.07	15.89	-	0.81
8-8-72	1.88	0.60	10.07	0.51	13.43	28.43	18.59	14.36	-	0.77
8-23-72	2.53	0.71	10.86	0.44	14.21	28.41	-	-	-	0.74
9-7-72	1.65	0.60	9.42	0.39	12.04	26.26	17.57	14.64	21.67	0.69
9-20-72	1.75	0.62	9.79	0.39	11.20	25.69	-	-	-	0.69
10-11-72	-	0.54	9.99	0.38	12.08	24.65	18.67	14.58	-	0.72
10-24-72	3.44	0.62	11.23	0.44	12.92	30.51	19.38	15.35	-	0.91
11-8-72	2.04	0.39	7.52	0.30	9.09	17.86	13.16	10.99	-	0.59
11-21-72	1.96	0.36	6.25	0.26	5.92	14.29	12.33	11.25	-	0.52
11-30-72	2.55	0.44	8.86	0.35	7.69	20.69	17.39	13.64	25.70	0.69
12-19-72	2.31	0.37	6.95	0.36	6.23	-	16.70	11.50	-	0.65

TABLE 7 cont'd

CELL D LEACHATE
ELECTRO-CONDUCTIVITY/PARAMETER RATIOS

DATE	PARAMETER									
	ALKALINITY	BOD	CALCIUM	COD	CHLORIDE	MAGNESIUM	POTASSIUM	SODIUM	SULPHATE	TDS
1-10-73	2.78	0.47	8.59	0.41	10.43	21.88	18.67	14.05	-	0.72
1-23-73	2.04	0.33	8.94	0.28	8.10	15.58	11.62	9.60	-	0.52
2-6-73	1.46	0.37	12.03	0.21	5.98	11.72	9.12	7.27	-	0.40
2-27-73	-	0.33	5.30	0.23	5.71	11.00	10.94	7.38	-	0.43
3-13-73	1.42	0.34	5.00	0.24	5.30	18.04	11.48	7.88	15.91	0.41
3-27-73	1.10	0.28	4.33	0.20	4.35	9.80	8.82	6.64	-	0.34
4-10-73	1.36	0.25	4.33	0.21	5.38	10.79	9.84	6.82	-	0.35
4-24-73	1.22	0.25	3.75	0.21	5.17	9.93	9.38	7.00	-	0.35
5-15-73	1.06	0.30	3.94	0.19	3.31	7.14	17.14	5.45	15.19	0.31
6-5-73	1.43	0.38	5.55	0.26	3.83	11.36	-	-	-	0.40
6-26-73	1.27	0.36	5.92	0.26	4.89	17.72	21.54	13.73	21.79	0.38
7-17-73	1.13	0.26	6.23	-	4.94	9.51	11.33	6.51	-	0.37
8-7-73	1.43	0.54	8.61	0.40	5.71	13.27	11.76	7.65	-	0.49
4-29-73	1.56	0.59	11.61	0.56	6.75	15.65	-	-	-	0.63
9-18-73	0.89	0.47	7.00	0.47	4.09	9.85	7.65	5.54	47.56	0.77
10-9-73	0.93	0.95	8.75	0.77	4.36	11.41	-	-	-	0.55
10-30-73	1.95	2.71	16.12	1.81	8.94	23.33	19.76	10.91	-	1.24
11-20-73	1.43	1.88	9.36	1.01	6.65	17.86	13.95	-	-	0.77
12-11-73	0.88	2.10	7.31	1.24	2.05	12.75	10.73	6.57	36.07	0.68
1-4-74	0.82	2.31	6.79	1.28	3.01	9.46	-	-	-	0.55
1-22-74	0.39	1.50	3.73	1.13	1.14	4.66	3.80	2.33	-	0.30
2-12-74	1.58	6.36	17.81	5.18	2.93	26.52	-	-	-	1.36
3-6-74	2.26	6.67	22.16	6.59	4.08	29.20	22.73	14.55	-	1.71

TABLE 7 cont'd

CELL D LEACHATE
ELECTRO-CONDUCTIVITY/PARAMETER RATIOS

DATE	PARAMETER									
	ALKALINITY	BOD	CALCIUM	COD	CHLORIDE	MAGNESIUM	POTASSIUM	SODIUM	SULPHATE	TDS
3-28-74	2.90	15.58	16.49	7.89	-	18.79	-	-	-	1.29
4-17-74	2.30	23.66	-	9.47	7.67	20.00	22.52	12.50	12.91	1.63
			STATISTICAL SUMMARY OF DATA							
Period Averages			Mean Values for 18-Week Time Periods							
1-18-72 to 4-11-72	2.38	0.49	8.56	0.31	10.37	20.80	13.03	11.29	12.07	0.64
4-25-72 to 7-11-72	2.24	0.44	9.76	0.36	11.35	27.10	16.85	12.52	13.50	0.71
7-25-72 to 10-11-72	2.53	0.44	8.23	0.42	12.83	26.05	18.23	14.87	21.67	0.74
10-24-72 to 1-10-73	2.51	0.44	8.23	0.35	8.71	21.05	16.27	12.79	25.70	0.68
1-23-73 to 4-10-73	1.48	0.32	6.66	0.23	5.80	12.82	10.30	7.60	15.91	0.41
4-24-73 to 8-7-73	1.26	0.35	5.67	0.26	4.64	11.49	14.23	8.07	18.49	0.38
8-29-73 to 12-11-73	1.27	1.45	10.03	0.98	5.47	15.14	13.02	7.67	41.82	0.77
1-4-74 to 4-17-74	1.71	9.35	13.40	5.26	3.77	18.11	16.35	9.73	12.91	1.14
			Mean Values and Standard Deviations for Total Study Period							
Data Points	46	38*	47	37*	47	48	34	33	13	48
Mean	1.86	0.45*	8.96	0.33*	7.95	20.01	14.54	10.58	20.07	0.68
Std. Dev.	±0.70	±0.12*	±3.71	±0.10*	±3.58	±10.08	±4.58	±3.61	±10.85	±0.31

* Data from 10/9/73 on is not included in calculation of mean and standard deviation.

TABLE 8

COMPANION THERMISTOR COMPARISON

DATE	TEMPERATURE - ° C	
	Thermistor Inside Top Gas Probe Cell B	Thermistor Outside Top Gas Probe Cell B
12-2-71	22.2	22.2
12-3-71	21.0	21.1
12-6-71	20.9	20.8
12-7-71	21.7	21.7
12-8-71	21.7	21.8
12-9-71	22.7	22.7
12-10-71	22.6	22.6
12-14-71	25.6	25.6
12-15-71	21.3	21.2
12-16-71	21.3	21.1
12-17-71	21.2	21.0
12-20-71	20.9	20.9
12-28-71	20.0	20.1
12-29-71	19.8	20.1
1-27-72	17.2	16.7
2-15-72	15.9	15.6
3-14-72	16.9	16.8
3-28-72	17.5	17.4
4-11-72	17.5	17.4
4-25-72	17.6	17.5
5-9-72	18.8	18.7
5-23-72	20.0	20.0
6-6-72	21.1	21.1

TABLE 9

LEACHATE LABORATORY STUDIES

ITEM	CALIFORNIA STUDIES	W. VIRGINIA STUDIES	DREXEL STUDIES	GEORGIA TECH STUDIES
1. Experimental setup.	Wooden bin (8x4x12') used at landfill site and covered with soil.	Concrete cylinders 3 feet in diameter. Height: A. 4 feet B. 8 feet C. 12 feet	Laboratory lysimeter: 6x6x14 feet.	Corrugated steel pipe 36 inches in diameter, 14 feet in height.
2. Fill used.	Fresh domestic rubbish excluding cans, bottles cardboard boxes and large pieces of miscellaneous material.	Municipal refuse excluding metals, cans, bottles, stones and large pieces of wood.	Municipal refuse.	Simulated municipal refuse.
3. Depth of refuse.	10 feet	A. 3.6 feet B. 7.6 feet C. 11.6 feet (including covers)	8 feet	10 feet
4. Total water applied.	18.7 inches	70 inches		
5. Total leachate produced.	6.2 inches (410 gal.)	A. 37.33 inches B. 31.32 inches C. 20.36 inches		
6. Duration of study.	216 days	163 days	700 days	600 days
7. Number of samples analyzed.	35	16		
8. Controlled parameter.	Applied water.	Applied water - fill depth.	Applied water.	
9. Reference	State of California (1952).	Qasim and Burchinal (1970).	Fungaroli (1971 a,b).	Mao and Pohland (1973).

TABLE 10

LEACHATE FIELD STUDIES

	ITEM	CALIFORNIA STUDIES	S. DAKOTA STUDIES	PENNSYLVANIA STUDIES	ILLINOIS STUDIES
1.	Location of landfill.	Riverside, California.	Brookings, S. Dakota.	Centre County, Pennsylvania.	1. DuPage County 2. Winnetha 3. Elgin 4. Woodstock 5. Blackwell Forest Pr.
2.	Type of fill material.	Domestic and commercial refuse.	Municipal refuse. Combustible material burned before filling.	Municipal refuse.	1. Municipal 2. Municipal 3. 40% Mun., 60% Ind. 4. 40% Mun., 60% Ind. 5. Municipal
3.	Age of fill at end of study.	4 years	6 years	9 years	1. 12 years 2. 23 years 3. 22 years 4. 30 years 5. 5 years
4.	Mode of collection.	Wells	Wells	Suction lysimeters	Wells
5.	Duration of study.	2 years	6 months	4 years	4 years
6.	Frequency of sampling.	12 samples/2 years	3-4 weeks	Monthly and bimonthly	
7.	In contact with water table?	Yes	Yes	No	1. No 2. Yes 3. No 4. Yes 5. Undetermined
8.	Reference	State of California (1954).	Andersen & Dornbush (1966).	Apgar & Langmuir (1971).	Hughes, et.al. (1971).

TABLE 11

SOLUTION ANALYSIS

Silty Sand

Determination - mg/l	Time After Immersion			
	1 week	6 months	1 year	2 years
Alkalinity	170	170	168	133
Calcium	30	34	48	32
Electrical Conductivity	500	500	600	450
Magnesium	30	23	29	13.3
Potassium	3.5	1.85	17.0	16
Sodium	31	32	34	28
pH	7.2	7.7	8.8	-

Concrete Sand

Determination - mg/l	Time After Immersion			
	1 week	6 months	1 year	2 years
Alkalinity	170	170	168	51
Calcium	28	36	32	6.4
Electrical Conductivity	500	500	500	220
Magnesium	31	23	28	1.9
Potassium	2.2	1.75	1.8	1.1
Sodium	31	31.6	32	34
pH	7.2	7.9	8.7	-

Pea Gravel

Determination - mg/l	Time After Immersion			
	1 week	6 months	1 year	2 years
Alkalinity	180	190	190	133
Calcium	33	54	40	38.5
Electrical Conductivity	480	550	460	310
Magnesium	26	16	25	12
Potassium	1.9	1.95	2.0	1.2
Sodium	31	29.6	31	30
pH	7.3	7.3	9.2	-

TABLE 12

WEIGHT, DENSITY, AND MOISTURE CONTENT OF REFUSE PLACED IN TEST CELLS BEFORE MOISTURE ADDED

Test Cell	Refuse Placed	Density After Compaction lb./yd.^{3}	Original Moisture Content % wet wt.	Weight of Water lb./yd.^{3}
A	530.35	1064	28.4	302.18
B	524.23	1052	27.3	287.20
C	521.72	1064	25.6	272.38
D	530.97	1065	22.7	241.76
E	521.93	1047	23.5	246.05

WEIGHT, DENSITY, AND MOISTURE CONTENT OF REFUSE PLACED IN TEST CELLS AFTER MOISTURE ADDED

Test Cell	Total Weight of Water Per Unit Volume After Moisture Added lb./yd.^{3}	Total Weight Per yd.^{3} After Moisture Added	Percent Water After Moisture Added	Differential Percent Due to Moisture Added
B	630.43	1395.23	45.18	+17.88
E	473.77	1274.72	37.17	+13.67

TABLE 13

TRACE METAL CONCENTRATIONS IN LEACHATE

CELLS A, B, & E

CELL A	ELEMENT - mg/l				
Date	Cu	Zn	Cd	Hg	Pb
2-15-72	ND	2.1	ND	0.0006	ND
9-7-72	ND	0.23	ND	0.0034	0.16
10-11-72	0.16	0.58	ND	0.0078	0.12
11-21-72	0.15	9.0	ND	0.0124	0.44
4-10-73	0.22	3.0	ND	0.0014	1.81
11-20-73	0.60	78.0	< 0.05	0.0092	0.86
12-13-73	0.27	64.0	< 0.05	0	1.0
1-22-74	0.46	57.0	0.072	0.045	0.33
3-6-74	1.08	32.0	0.044	<0.001	0.27
4-17-74	0.668	60.0	0.057	0.021	0.408
CELL B					
1-3-72	3.6	140.0	ND	0.006	3.0
10-24-72	0.29	62.0	0.19	0.0056	0.95
3-13-73	0.18	10.8	ND	0.0044	0.33
11-20-73	0.14	73.0	0.09	0	0.86
12-13-73	0.15	73.0	0.08	0	1.0
1-22-74	0.18	61.0	0.073	0.075	0.45
3-6-74	0.205	80.0	0.049	<0.001	0.27
4-17-74	0.116	63.0	0.065	0.016	0.488

ND - Not detected

TABLE 13 - Continued

TRACE METAL CONCENTRATIONS IN LEACHATE

CELLS A, B, & E

CELL E	ELEMENT - mg/l				
Date	Cu	Zn	Cd	Hg	Pb
2-15-72	ND	ND	-	0.0005	N
10-24-72	0.12	1.67	0.09	0.0172	0.60
1-23-73	0.10	41.0	ND	0.0144	0.60
3-13-73	0.19	5.6	ND	0.010	0.45
4-24-73	0.32	64.0	0.05	0.006	0.21
6-5-73	0.10	58.0	0.05	-	0.42
6-26-73	0.10	61.0	< 0.05	0.0174	0.73
8-7-73	-	32.5	<0.05	-	0.69
8-29-73	-	-	-	-	-
9-18-73	0.13	62.0	<0.1	-	0.54
10-30-73	0.12	68.0	< 0.05	0.0084	<0.2
11-20-73	0.12	18.0	<0.05	0.0144	0.65
12-13-73	0.22	18.5	0.07	0.07	1.0
1-22-74	0.09	70.8	0.073	0.05	0.38
3-6-74	0.17	109.0	0.070	< 0.001	0.62
4-17-74	0.372	50.0	0.068	0.024	0.50

ND - Not detected
- - No analysis made

TABLE 14

TRACE METAL CONCENTRATIONS IN LEACHATE

CELL C

Date	ELEMENT - mg/l				
	Cu	Zn	Cd	Hg	Pb
3-2-72	0.6	42.0	ND	0.0014	ND
4-11-72	ND	30.0	ND	0.0016	ND
5-9-72	ND	30.0	ND	0.015	ND
6-6-72	0.15	22.0	0.1	0.0102	0.8
7-11-72	0.15	13.0	ND	0.0005	ND
7-25-72	0.18	10.0	ND	-	0.1
8-8-72	0.13	9.5	ND	0.0175	0.2
9-7-72	0.07	7.5	ND	0.0068	0.22
10-11-72	0.08	6.5	ND	0.005	0.15
10-24-72	0.06	7.5	0.05	-	0.35
11-8-72	0.11	8.5	0.06	0.0034	0.15
11-21-72	0.1	8.0	0.04	-	0.17
2-6-73	0.06	4.6	ND	0.0076	ND
2-27-73	0.06	4.5	ND	0.0209	ND
3-13-73	0.05	4.3	ND	0.0071	0.1
3-27-73	0.06	2.8	ND	-	-
4-10-73	0.08	3.5	0.05	0.0038	0.1
4-24-73	0.05	3.8	0.05	0.0084	0.1
5-15-73	0.04	2.5	0.05	0.0048	ND
6-26-73	0.02	0.6	<0.05	0.0002	Tr.

TABLE 14 - Continued

TRACE METAL CONCENTRATIONS IN LEACHATE

CELL C

Date	Cu	Zn	Cd	Hg	Pb
7-17-73	0.05	0.72	<0.05	-	<0.1
8-7-73	0.04	0.8	<0.05	0	0
8-29-73	-	-	-	-	-
9-18-73	0.11	0.7	<0.05	-	0.2
10-9-73	0.23	-	<0.05	-	0
10-30-73	0.15	0.6	<0.05	0	<0.2
11-20-73	0.18	1.8	0.05	0	0.24
12-11-73	0.08	0.6	0	0	0
1-4-74	-	-	-	-	-
1-22-74	0.04	1.7	0.01	0.01	0.07
2-12-74	-	-	-	-	-
3-6-74	0.10	0.33	0.013	0.001	<0.01
3-28-74	-	-	-	-	-
4-17-74	0.036	0.5	<0.006	0.006	0.096
5-7-74	-	-	-	-	-
5-28-74	-	-	-	-	-

TABLE 15

TRACE METAL CONCENTRATIONS IN LEACHATE

CELL D

	ELEMENT - mg/l				
DATE	Cu	Zn	Cd	Hg	Pb
1-18-72	0.4	95.0	0.1	0.003	2.0
3-2-72	ND	40.0	ND	0.0058	ND
4-11-72	ND	40.0	ND	0.0028	1.0
5-9-72	ND	30.0	ND	0.0066	ND
6-6-72	0.1	30.0	0.13	0.0052	0.5
7-11-72	0.15	28.0	ND	0.0045	0.18
7-25-72	0.16	28.0	ND	-	0.35
8-8-72	0.14	-	ND	0.0095	0.64
9-7-72	0.15	21.5	ND	0.005	0.36
10-11-72	0.25	29.5	ND	0.005	0.59
10-24-72	0.1	28.5	0.16	-	0.47
11-8-72	0.35	27.5	0.09	0.0008	0.32
11-21-72	0.32	25.0	0.04	-	0.37
1-10-73	0.29	21.0	ND	0.011	0.43
1-23-73	0.08	22.5	ND	0.0156	0.40
2-6-73	0.11	17.8	ND	0.0076	0.23
2-27-73	0.12	17.6	ND	0.0209	0.46
3-13-73	0.09	16.9	ND	0.0084	0.24
3-27-73	0.12	17.5	ND	0.0016	-
4-10-73	0.08	14.0	0.05	0.002	0.1
4-24-73	0.06	15.0	0.05	0.0016	0.5
5-15-73	0.04	12.0	0.05	0.0022	ND
6-26-73	0.08	8.5	<0.05	0	0.31

ND - Not detected

- - No analysis made

TABLE 15 - Continued

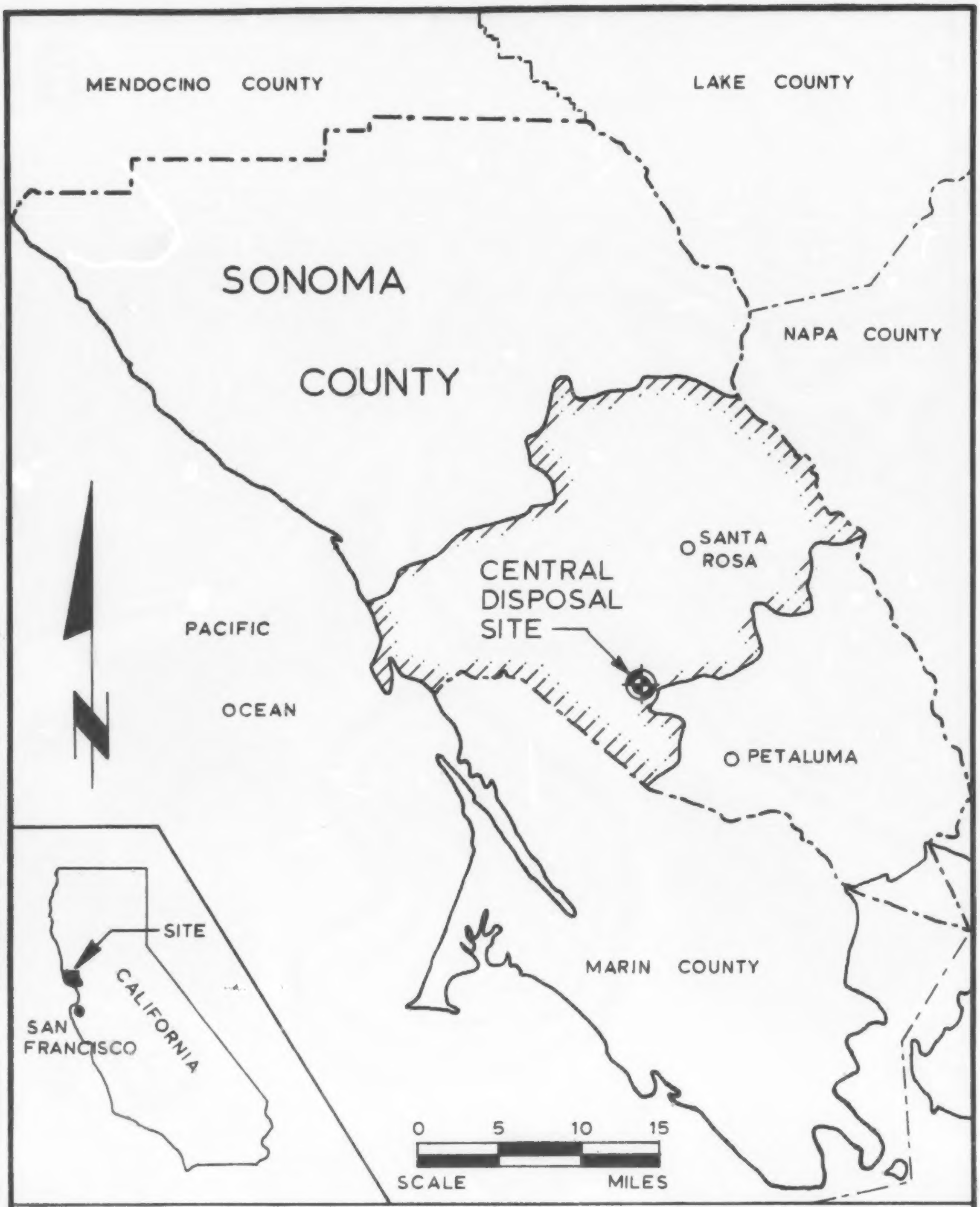
TRACE METAL CONCENTRATIONS IN LEACHATE

CELL D

	ELEMENT - mg/l				
DATE	Cu	Zn	Cd	Hg	Pb
7-17-73	0.08	17.5	<0.05	-	<0.1
8-7-73	0.05	3.5	<0.05	0	0.37
8-29-73	-	-	-	-	-
9-18-73	0.09	4.5	<0.05	-	0.20
10-9-73	-	-	<0.05	-	-
10-30-73	0.12	3.0	<0.05	0	<0.2
11-20-73	0.28	3.2	<0.05	0.004	0.24
12-13-73	0.08	2.4	0	0.0036	0.53
1-4-74	-	-	-	-	-
1-22-74	0.03	1.6	0.012	0.015	0.13
2-12-74	-	-	-	-	-
3-6-74	0.045	-	0.005	0.0011	<0.01
3-28-74	-	-	-	-	-
4-17-74	0.055	1.12	0.017	0.041	<0.01
5-7-74	-	-	-	-	-
5-28-74	-	-	-	-	-

- No analysis made

FIGURES


MENDOCINO COUNTY
LAKE COUNTY
SONOMA COUNTY
NAPA COUNTY
SANTA ROSA
CENTRAL DISPOSAL SITE
PACIFIC OCEAN
PETALUMA
MARIN COUNTY
SITE
CALIFORNIA
SAN FRANCISCO
0 5 10 15
SCALE MILES

LEGEND

▨ CENTRAL SERVICE AREA

LOCATION MAP

By GNM Date 1-72 Checked By RL Location Sonoma County, California

Project Number 102-1.3 Client Sonoma County

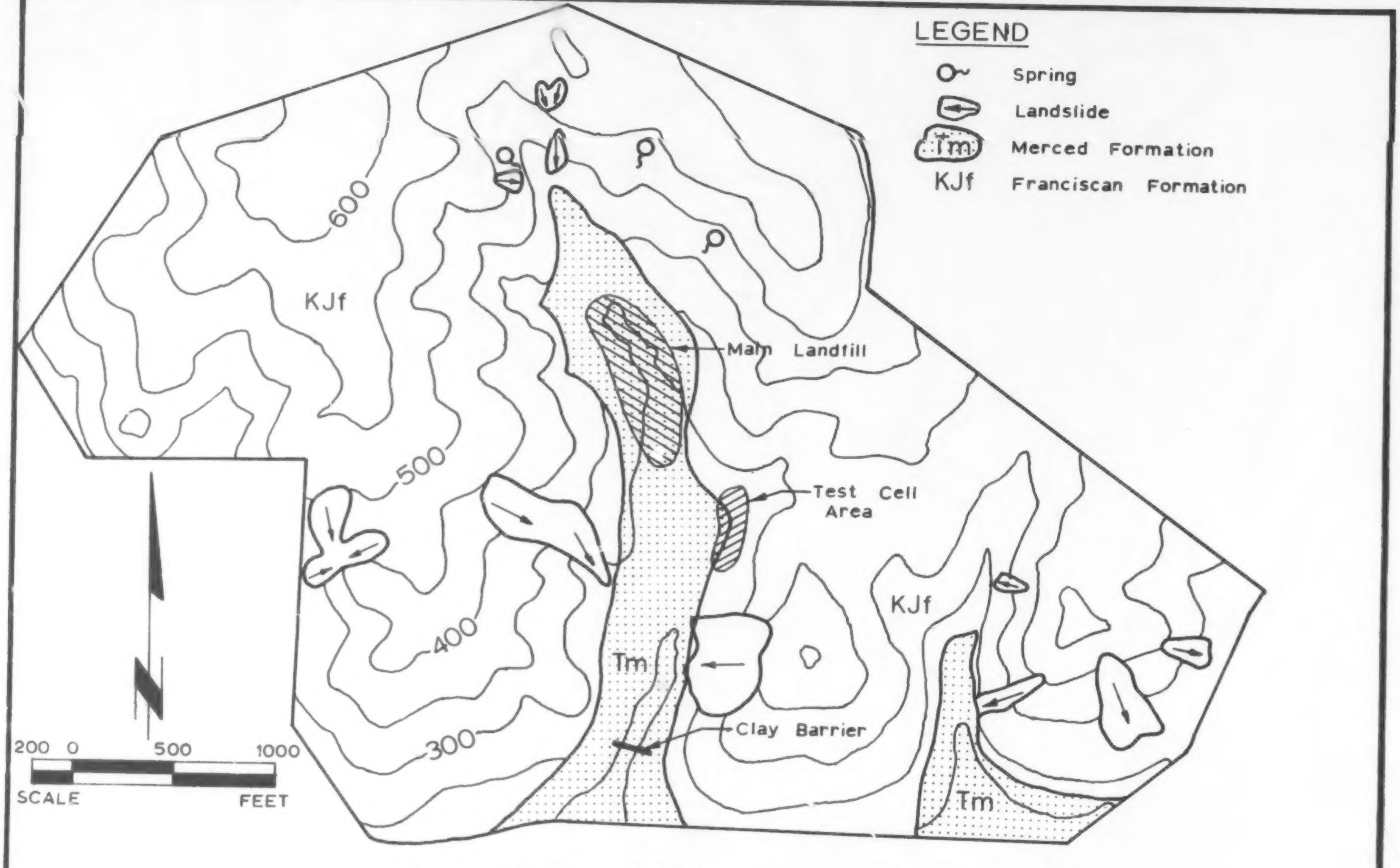
TI 1(8-71)

FIGURE 1

TI 1(8-71)

By GNM Date 1-72 Checked By RL

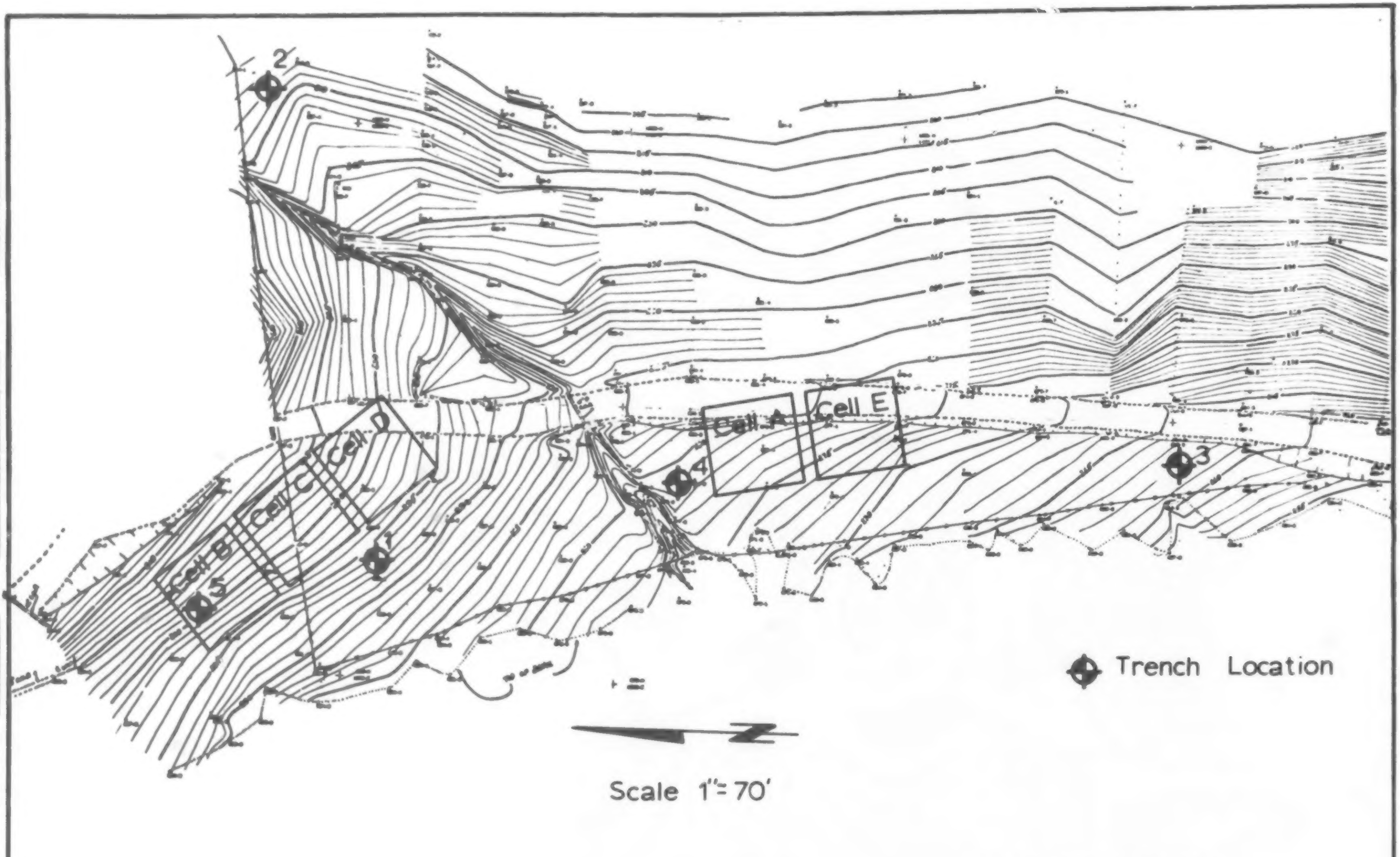
Project Number 102-1.3 Client Sonoma County Location Sonoma County, California


LEGEND
Spring
Landslide
Tm Merced Formation
KJf Franciscan Formation
600
500
400
300
KJf
Tm
Main Landfill
Test Cell Area
Clay Barrier
200 0 500 1000
SCALE FEET

GEOLOGIC MAP, CENTRAL DISPOSAL SITE

FIGURE 2

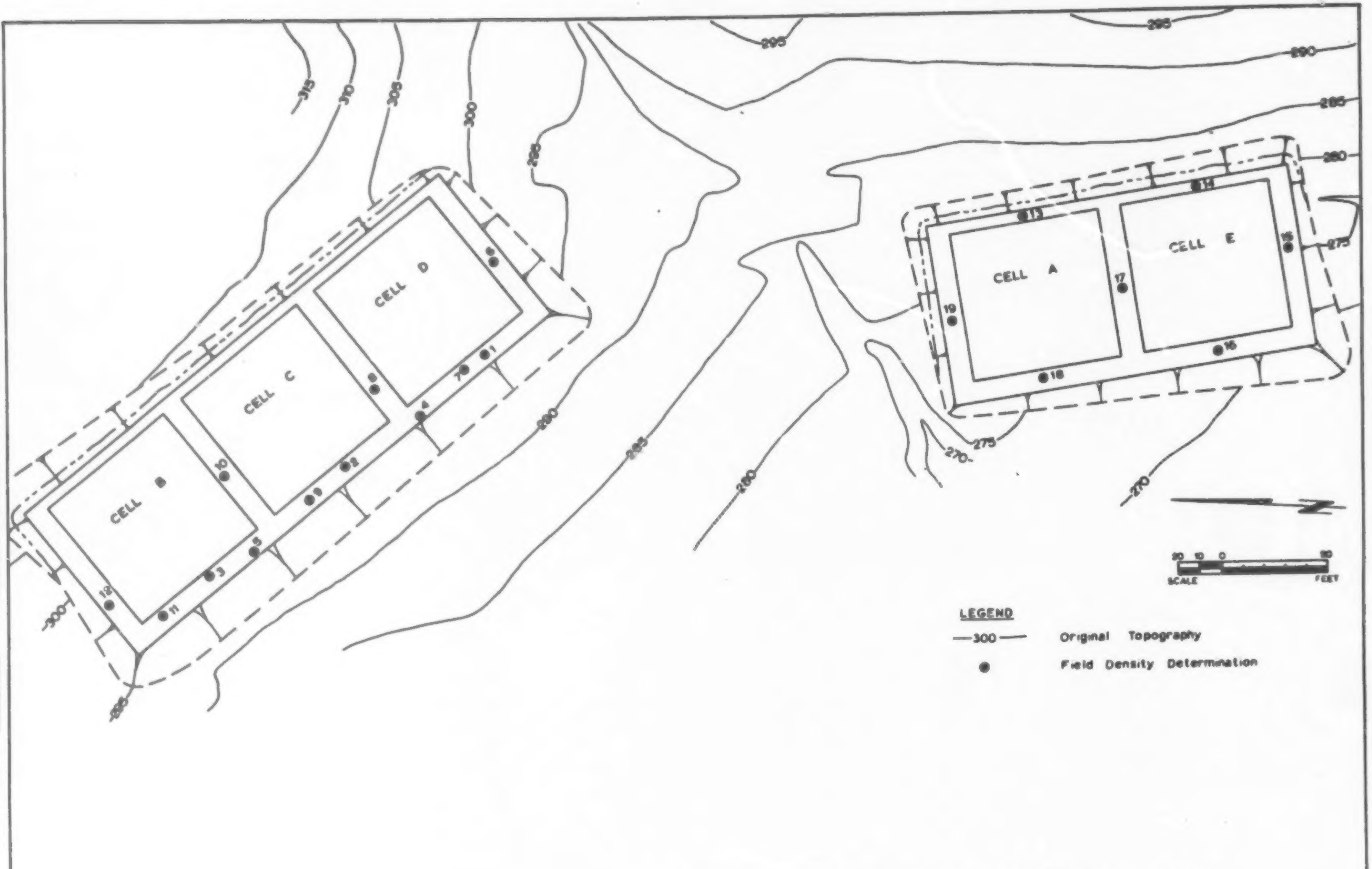
By GNM Date 1-72 Checked By RL Location Sonoma County
Project Number 102-1.3 Client Sonoma County


2
Cell D
Cell C
Cell B
5
7
4
Cell A
Cell E
3
Trench Location
Scale 1"= 70'

EXPLORATION MAP

FIGURE 3

By GNM Date 1-72 Checked By
Project Number 102-13 Client Sonoma County Location Sonoma County


CELL A
CELL B
CELL C
CELL D
CELL E
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
315
310
305
300
295
290
285
280
275
270
LEGEND
—300— Original Topography
● Field Density Determination
SCALE
20 10 0 50
FEET

FIELD DENSITY TEST LOCATION MAP

FIGURE 4

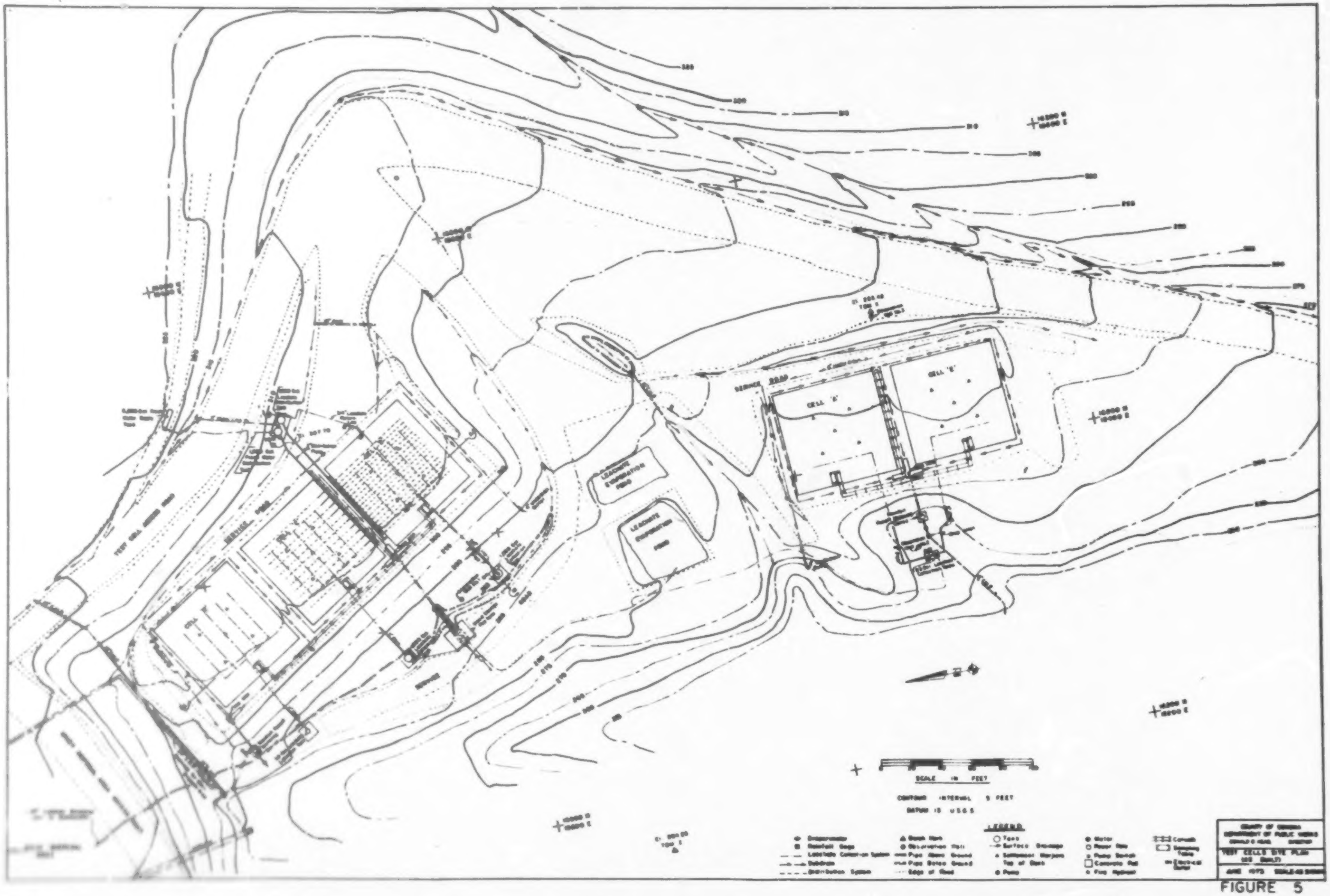

CELL 'A'
CELL 'B'
SERVICE ROAD
LEACHATE EVAPORATION POND
TEST CELL ACCESS ROAD
SCALE IN FEET
CONTOUR INTERVAL 5 FEET
DATUM IS U.S.G.S.
LEGEND
Evaporimeter
Rainfall Gage
Leachate Collection System
Subdrain
Distribution System
Bench Mark
Observation Well
Pipe Above Ground
Pipe Below Ground
Edge of Road
Tees
Surface Drainage
Settlement Markers
Top of Dam
Pump
Meter
Power Pole
Pump Switch
Concrete Pad
Fire Hydrant
Conduit
DEPARTMENT OF PUBLIC WORKS
TEST CELLS SITE PLAN
(AS BUILT)
JUNE 1973
SCALE AS SHOWN

FIGURE 5

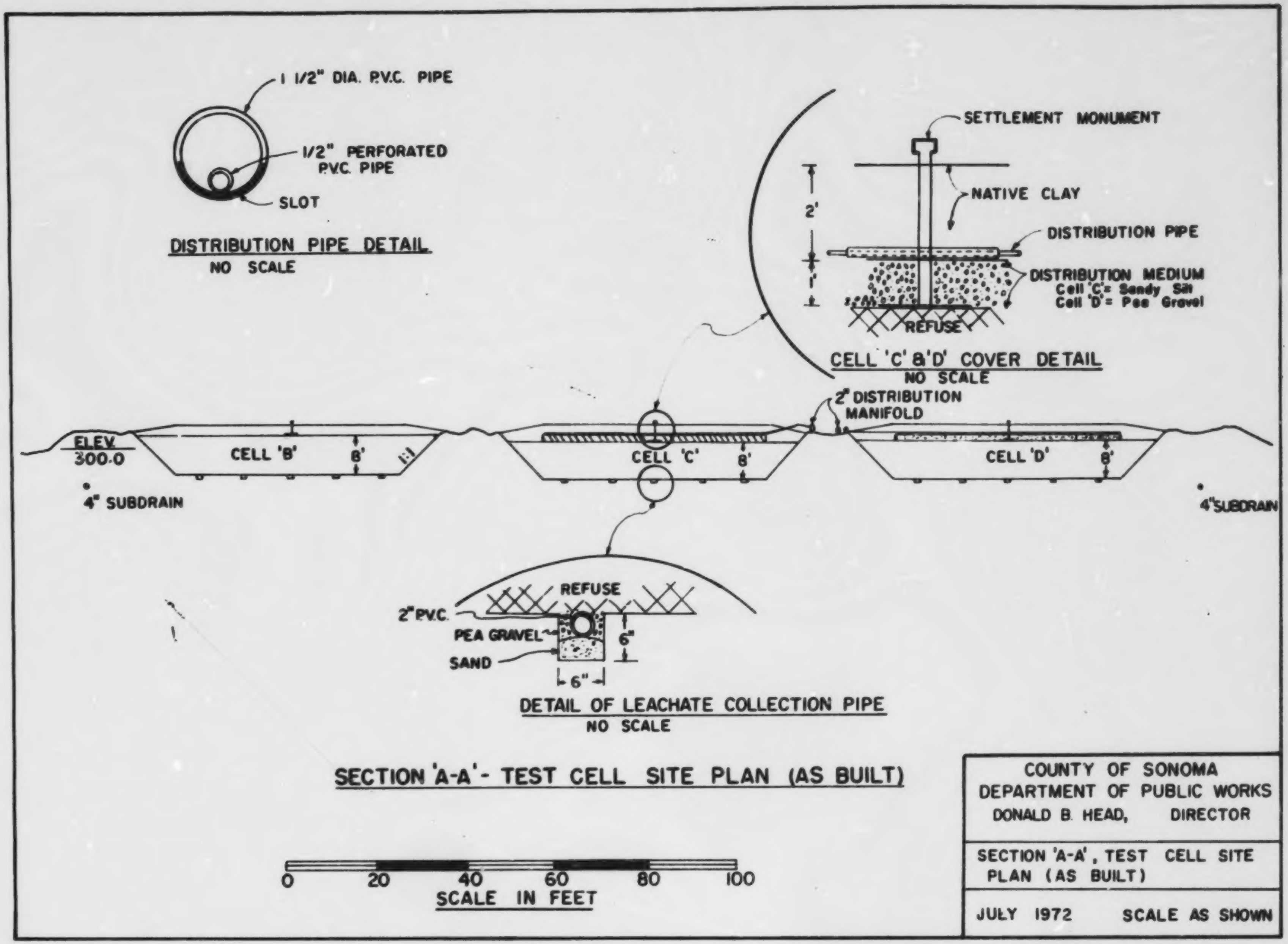
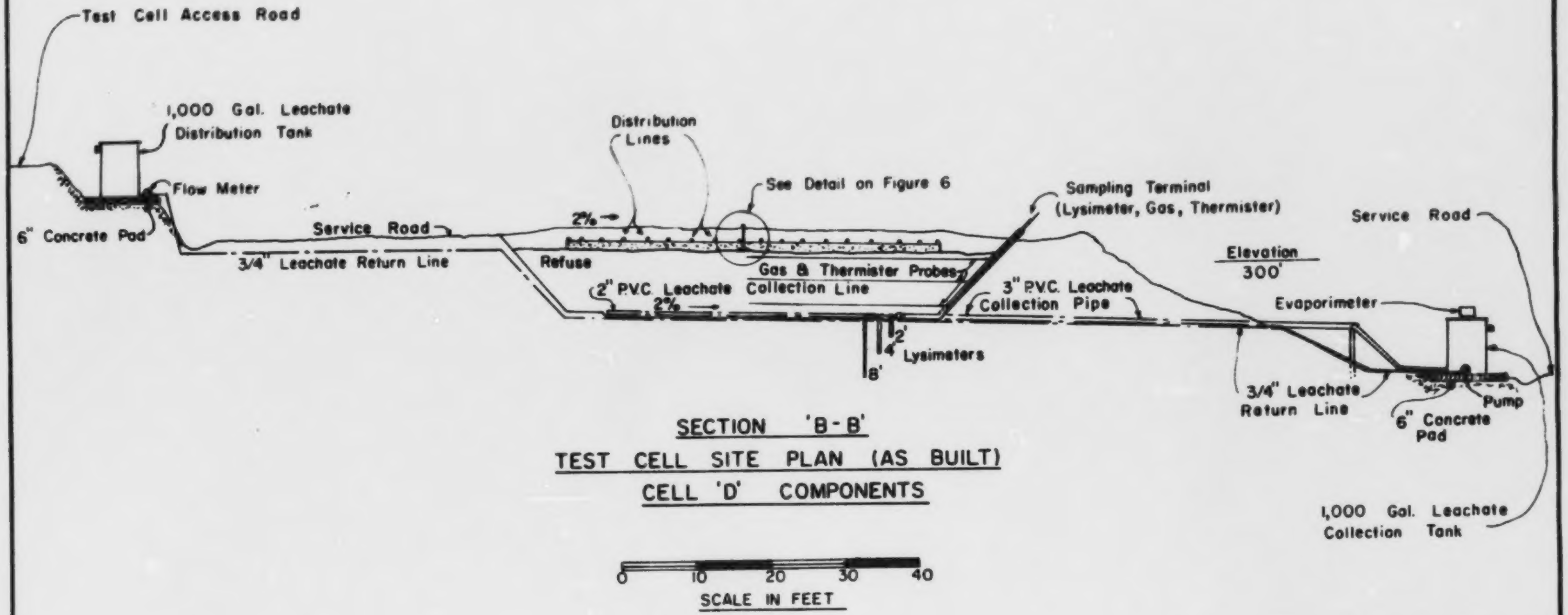

1 1/2" DIA. P.V.C. PIPE
1/2" PERFORATED P.V.C. PIPE
SLOT
DISTRIBUTION PIPE DETAIL
NO SCALE
SETTLEMENT MONUMENT
NATIVE CLAY
DISTRIBUTION PIPE
DISTRIBUTION MEDIUM
Cell 'C'= Sandy Silt
Cell 'D'= Pea Gravel
2'
1'
REFUSE
CELL 'C' & 'D' COVER DETAIL
NO SCALE
2" DISTRIBUTION MANIFOLD
ELEV. 300.0
CELL 'B'
8'
1:1
CELL 'C'
8'
CELL 'D'
8'
4" SUBDRAIN
4" SUBDRAIN
REFUSE
2" P.V.C.
PEA GRAVEL
SAND
6"
6"
DETAIL OF LEACHATE COLLECTION PIPE
NO SCALE
SECTION 'A-A' - TEST CELL SITE PLAN (AS BUILT)
0
20
40
60
80
100
SCALE IN FEET
COUNTY OF SONOMA
DEPARTMENT OF PUBLIC WORKS
DONALD B. HEAD, DIRECTOR
SECTION 'A-A', TEST CELL SITE PLAN (AS BUILT)
JULY 1972
SCALE AS SHOWN

FIGURE 6


Test Cell Access Road
1,000 Gal. Leachate Distribution Tank
Flow Meter
6" Concrete Pad
Service Road
3/4" Leachate Return Line
Distribution Lines
2% →
See Detail on Figure 6
Refuse
Gas & Thermister Probes
2" P.V.C. Leachate Collection Line
2% →
Lysimeters
2'
4'
8'
Sampling Terminal (Lysimeter, Gas, Thermister)
3" P.V.C. Leachate Collection Pipe
Elevation 300'
Service Road
Evaporimeter
3/4" Leachate Return Line
Pump
6" Concrete Pad
1,000 Gal. Leachate Collection Tank
0
10
20
30
40
SCALE IN FEET

SECTION 'B-B'
TEST CELL SITE PLAN (AS BUILT)
CELL 'D' COMPONENTS

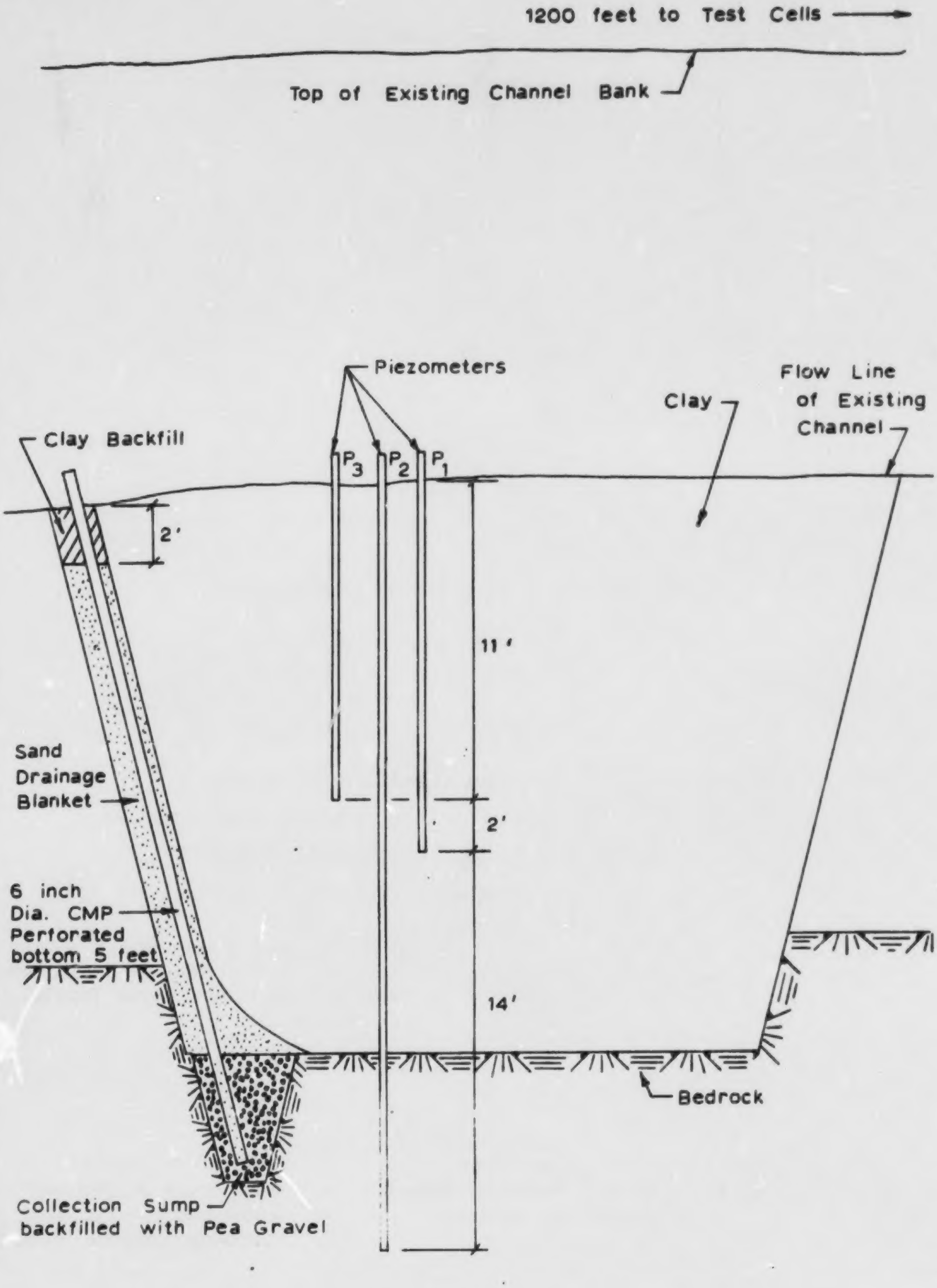
COUNTY OF SONOMA
DEPARTMENT OF PUBLIC WORKS
DONALD B. HEAD DIRECTOR

TEST CELL SITE PLAN
(AS BUILT)

JULY, 1972 SCALE AS SHOWN

FIGURE 7

By GNM
Project Number 102-1.3
Date 1-72
Client Sonoma County
Checked By RL
Location Sonoma County, California


1200 feet to Test Cells
Top of Existing Channel Bank
Piezometers
Flow Line of Existing Channel
Clay
Clay Backfill
P3
P2
P1
2'
11'
2'
14'
Sand Drainage Blanket
6 inch Dia. CMP Perforated bottom 5 feet
Bedrock
Collection Sump backfilled with Pea Gravel

CLAY BARRIER CROSS SECTION

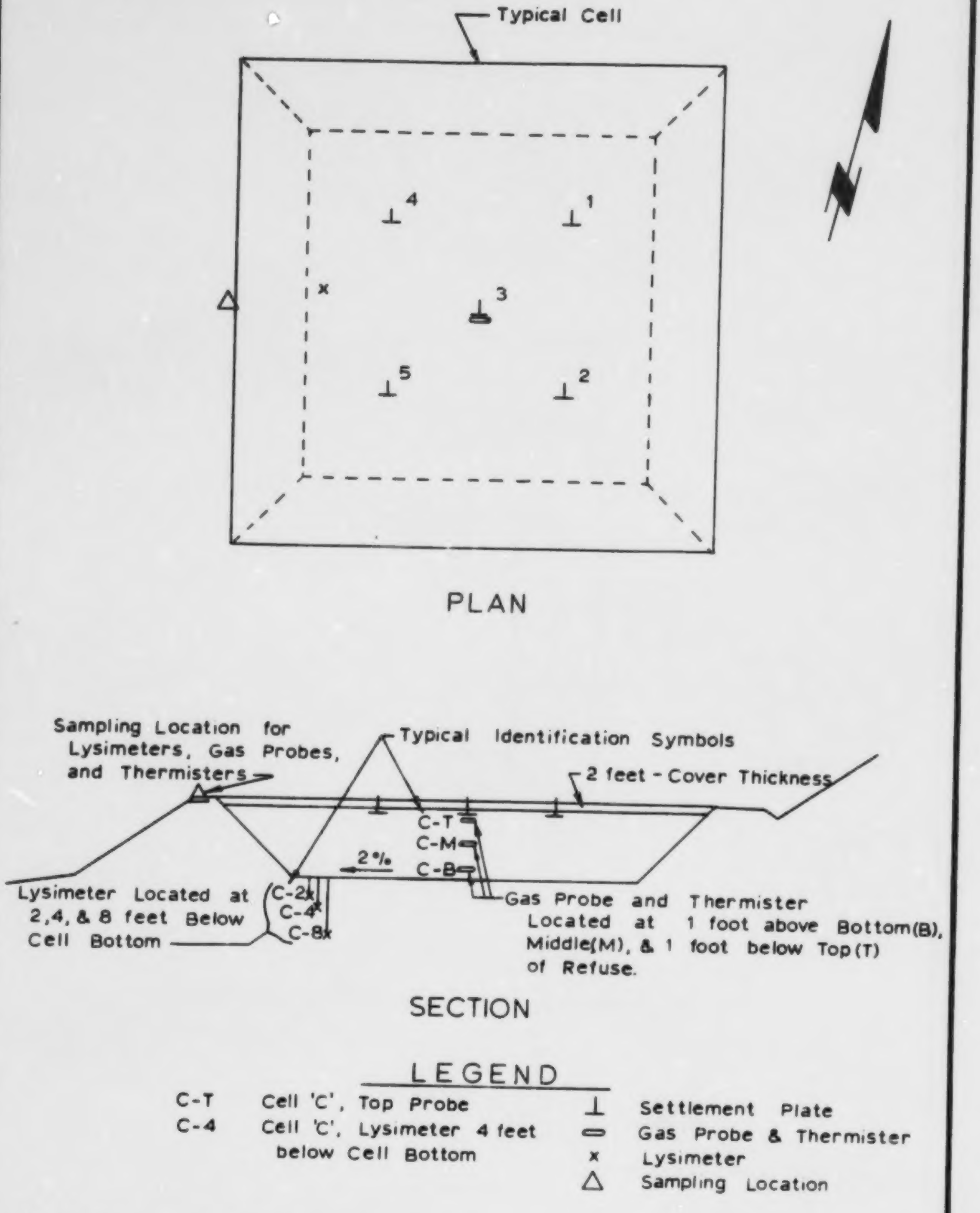
Scale: 1inch = 5 feet

TI 1(8-71)

FIGURE 8

By GNM Date 1-72 Checked By RL

Project Number 102-1.3 Client Sonoma County Location Sonoma County, California

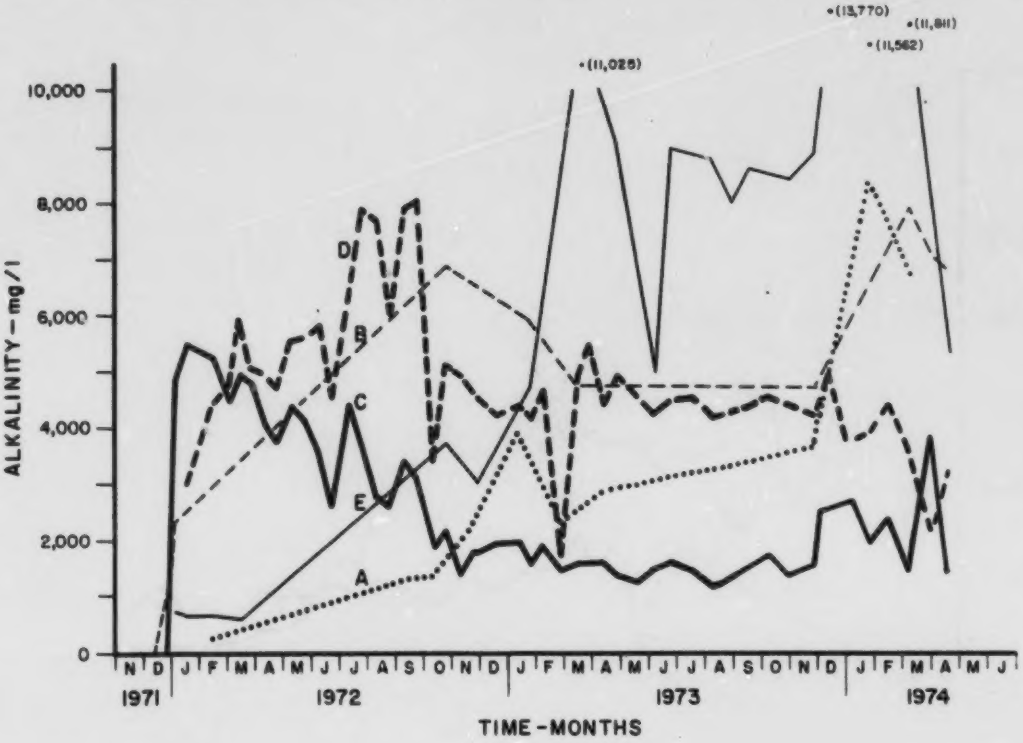

Typical Cell
4
1
3
5
2
PLAN
Sampling Location for Lysimeters, Gas Probes, and Thermisters
Typical Identification Symbols
2 feet - Cover Thickness
C-T
C-M
C-B
2%
Lysimeter Located at 2,4, & 8 feet Below Cell Bottom
C-2
C-4
C-8
Gas Probe and Thermister Located at 1 foot above Bottom(B), Middle(M), & 1 foot below Top(T) of Refuse.
SECTION
LEGEND
C-T Cell 'C', Top Probe
C-4 Cell 'C', Lysimeter 4 feet below Cell Bottom
⊥ Settlement Plate
Gas Probe & Thermister
x Lysimeter
△ Sampling Location

TYPICAL INSTRUMENTATION LOCATION

SCALE: 1 inch = 20 feet

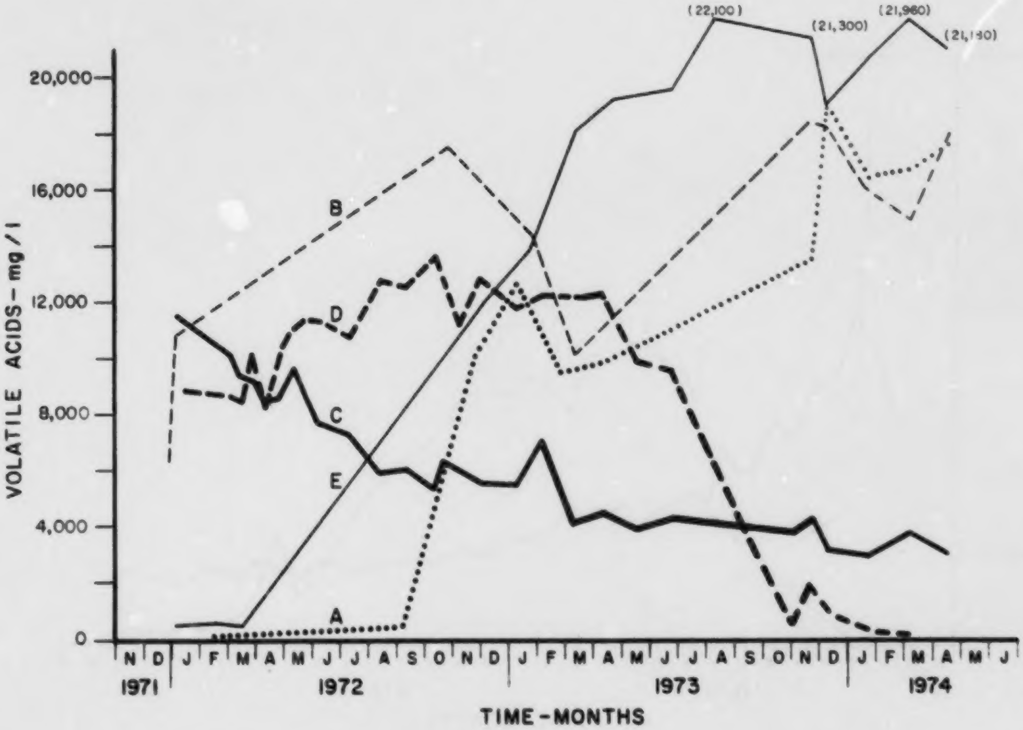
TI 1(8-71)

FIGURE 9



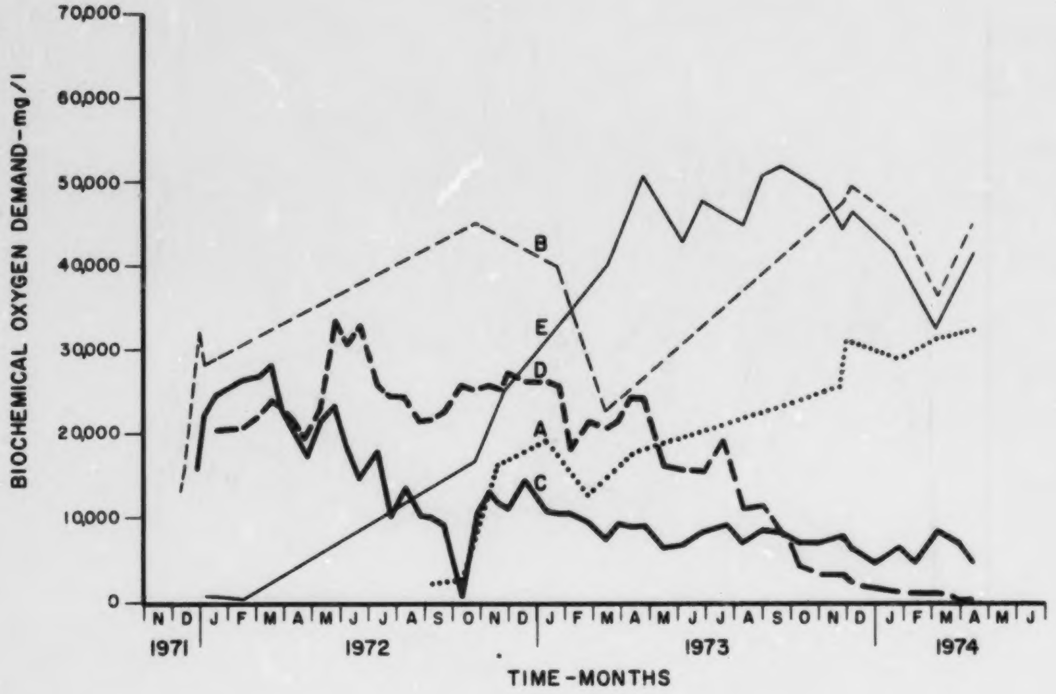
ALKALINITY OF LEACHATE

FIGURE 10

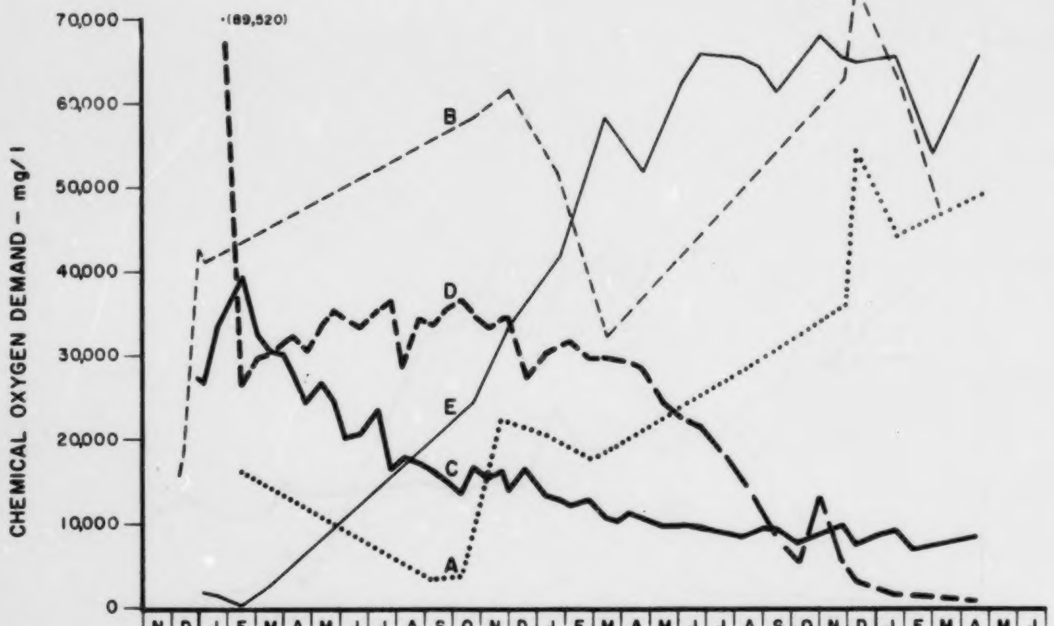


VOLATILE ACID CONCENTRATION OF LEACHATE

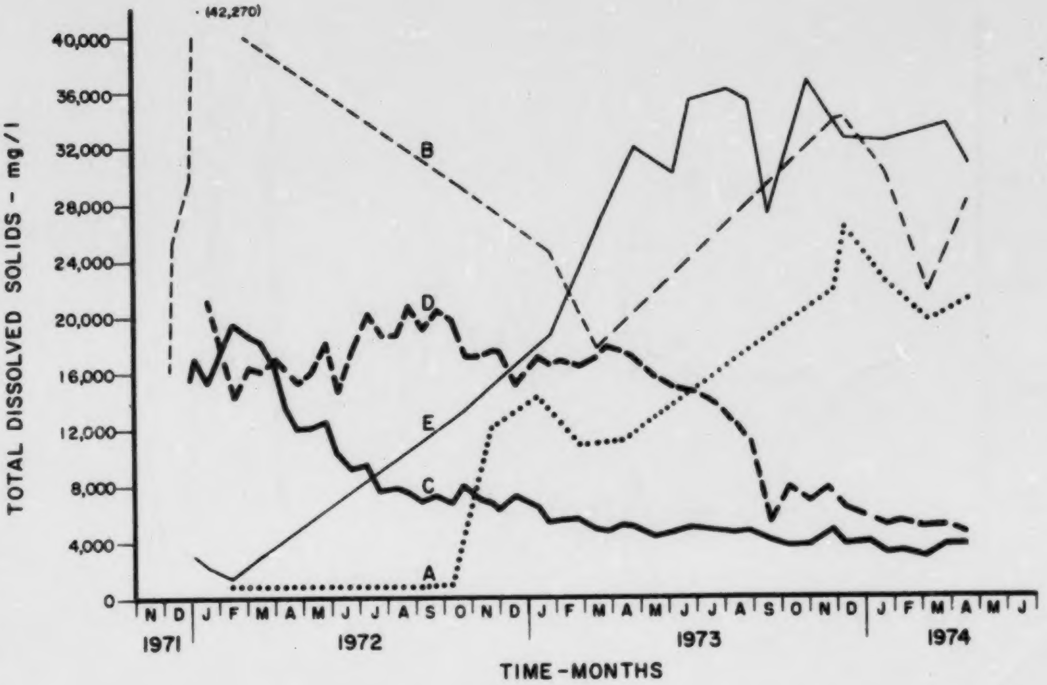
FIGURE 11



BIOCHEMICAL OXYGEN DEMAND OF LEACHATE **FIGURE 12**

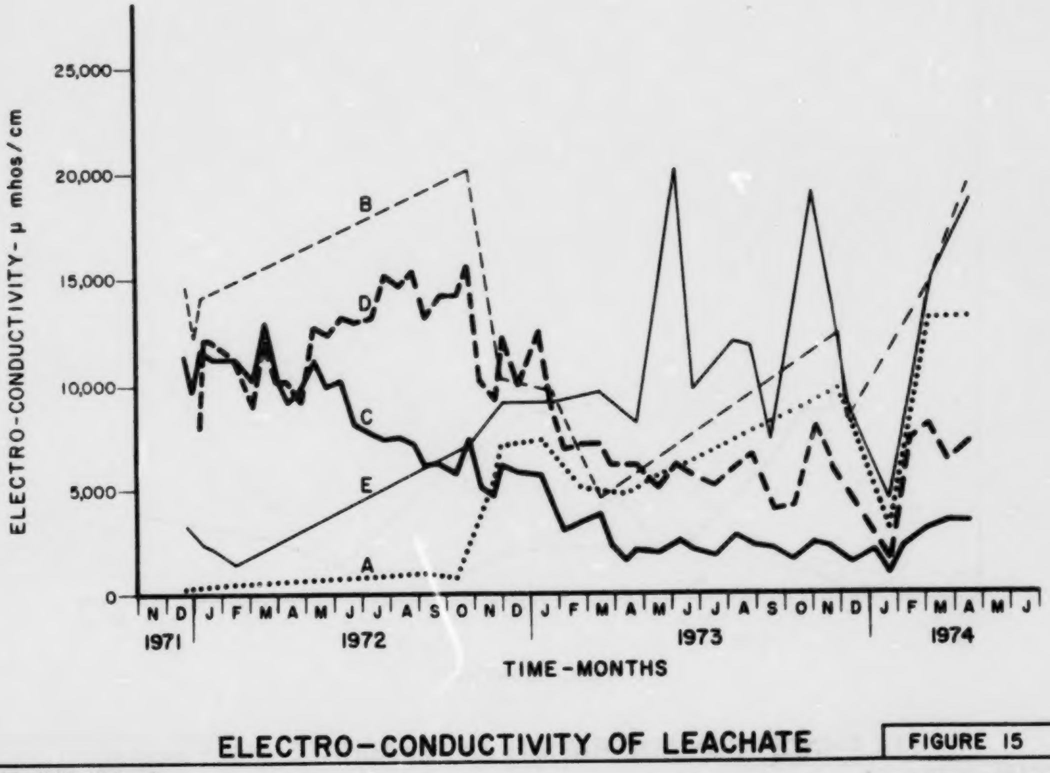


CHEMICAL OXYGEN DEMAND OF LEACHATE **FIGURE 13**



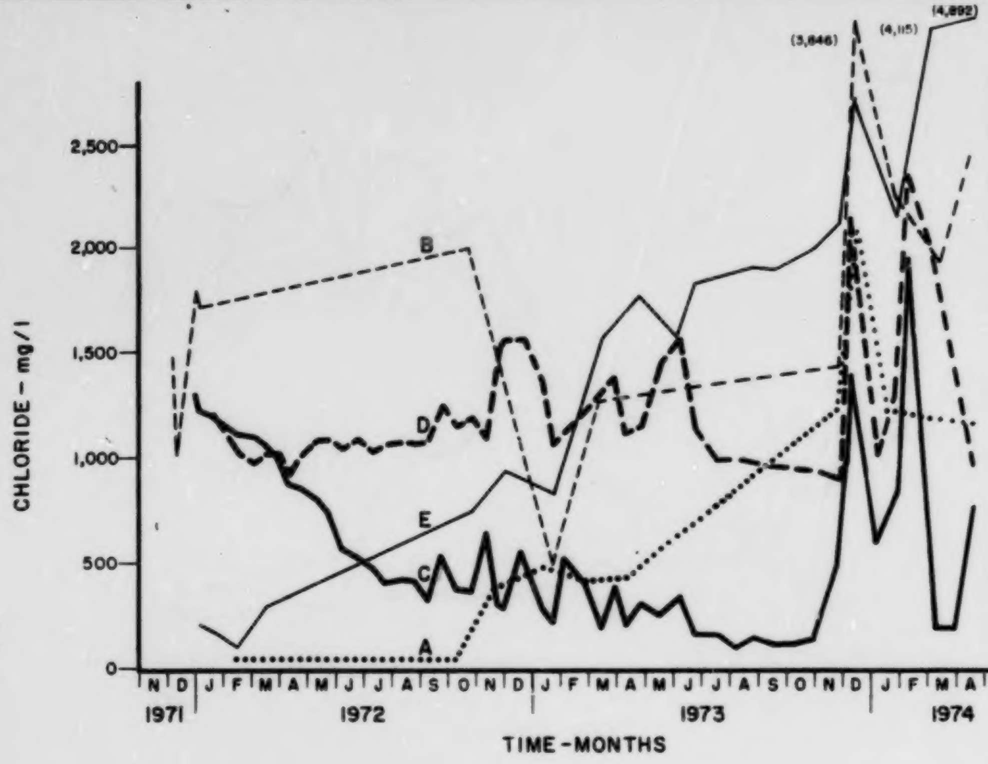
TOTAL DISSOLVED SOLIDS IN LEACHATE

FIGURE 14

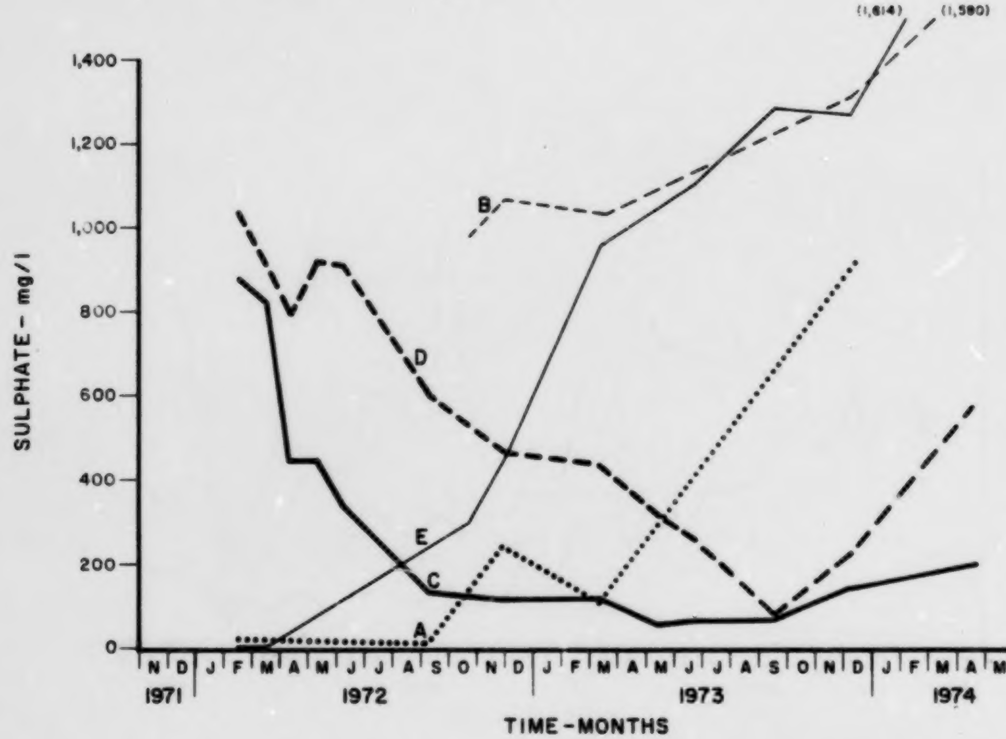


ELECTRO-CONDUCTIVITY OF LEACHATE

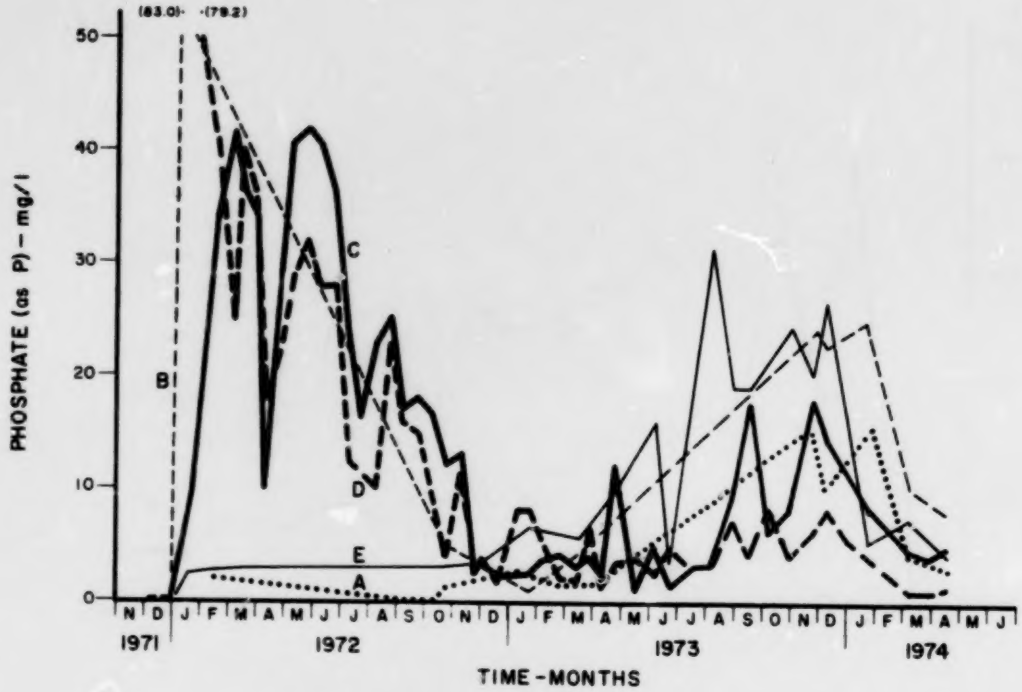
FIGURE 15



CHLORIDE CONCENTRATION OF LEACHATE **FIGURE 16**

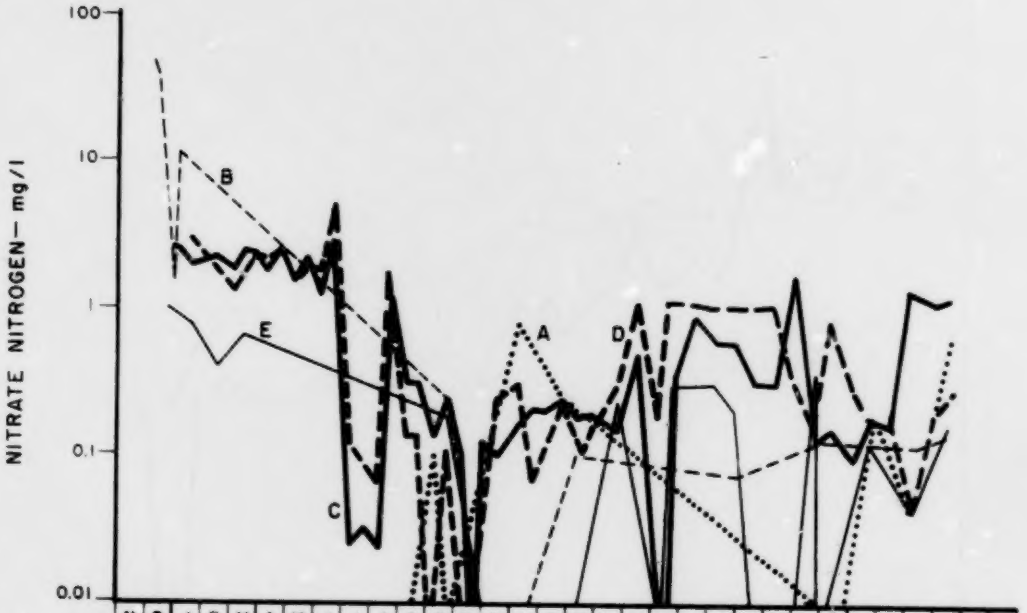


SULPHATE CONCENTRATION OF LEACHATE **FIGURE 17**



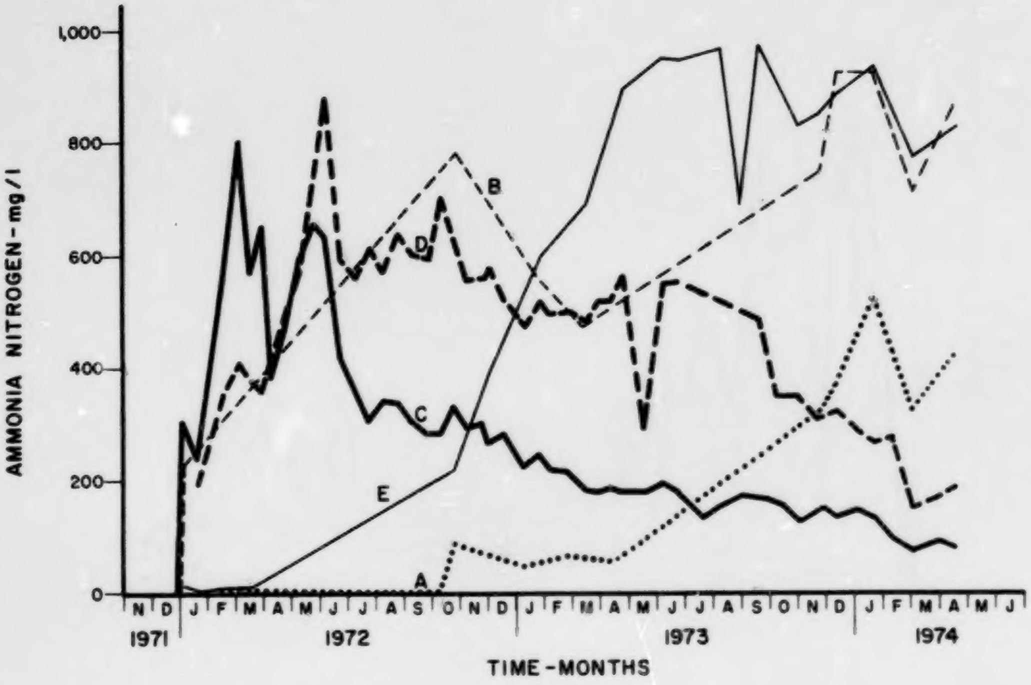
PHOSPHATE CONCENTRATION OF LEACHATE

FIGURE 18



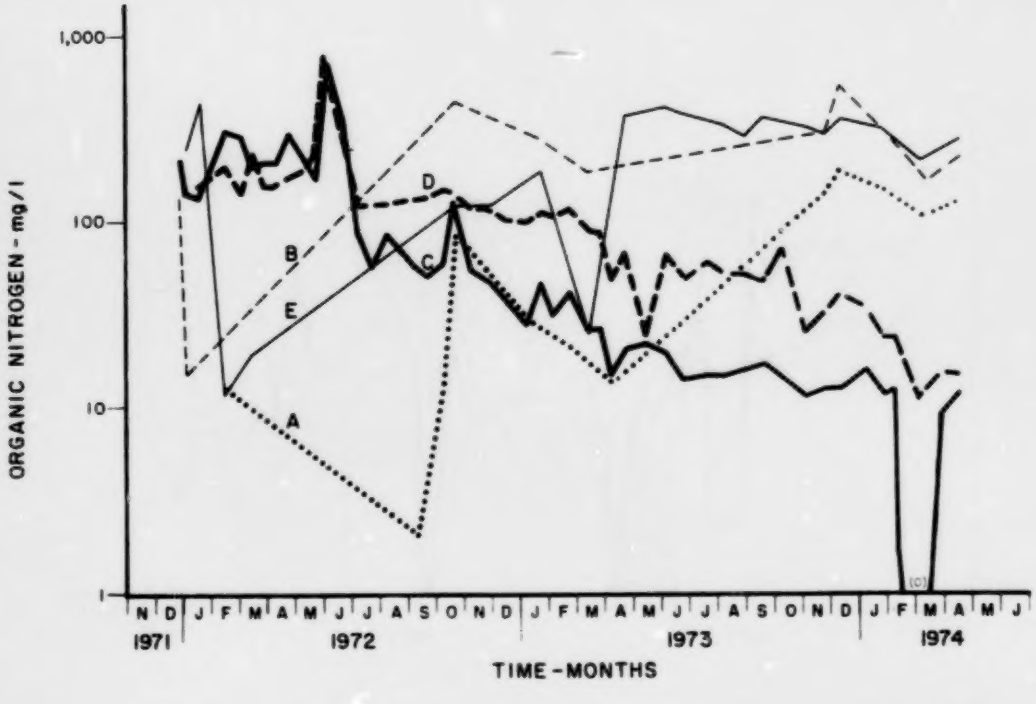
NITRATE-N CONCENTRATION OF LEACHATE

FIGURE 19



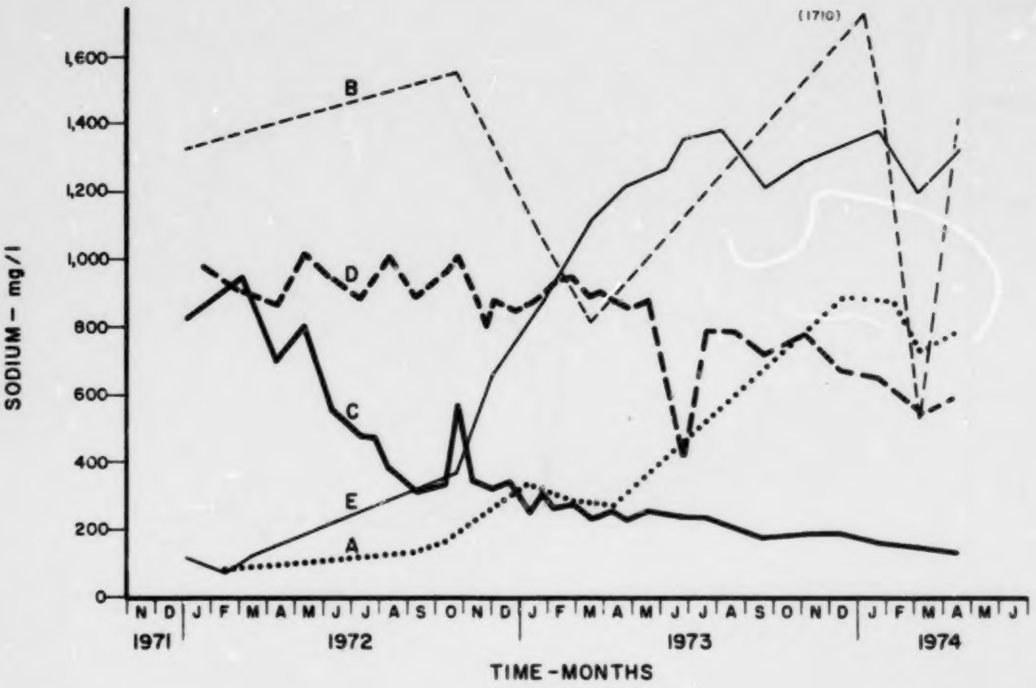
AMMONIA-N CONCENTRATION IN LEACHATE

FIGURE 20



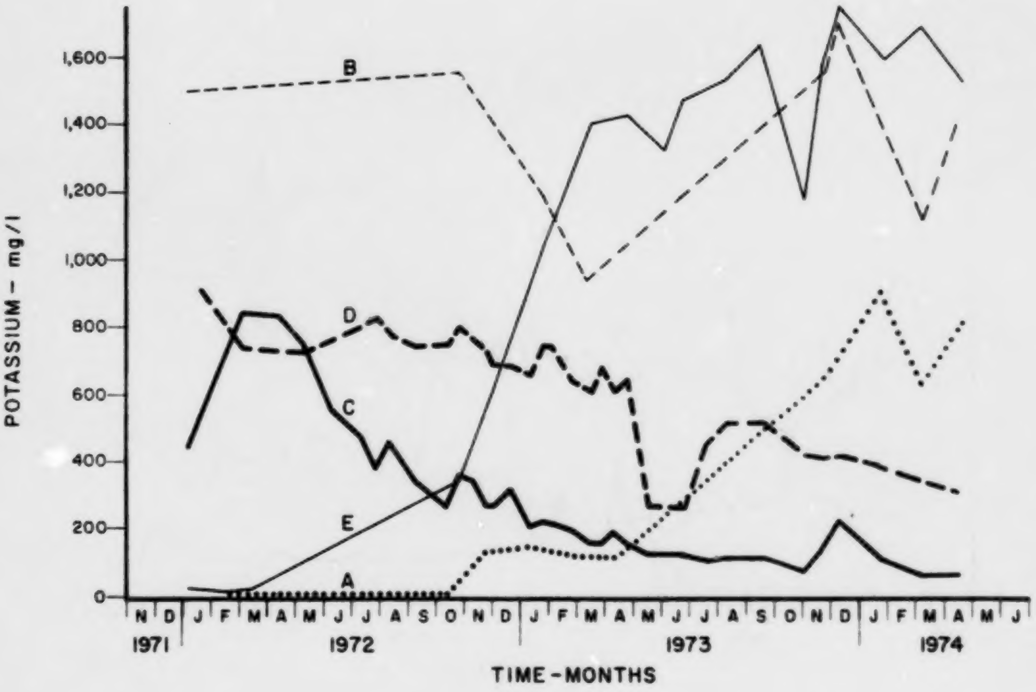
ORGANIC-N CONCENTRATION OF LEACHATE

FIGURE 21



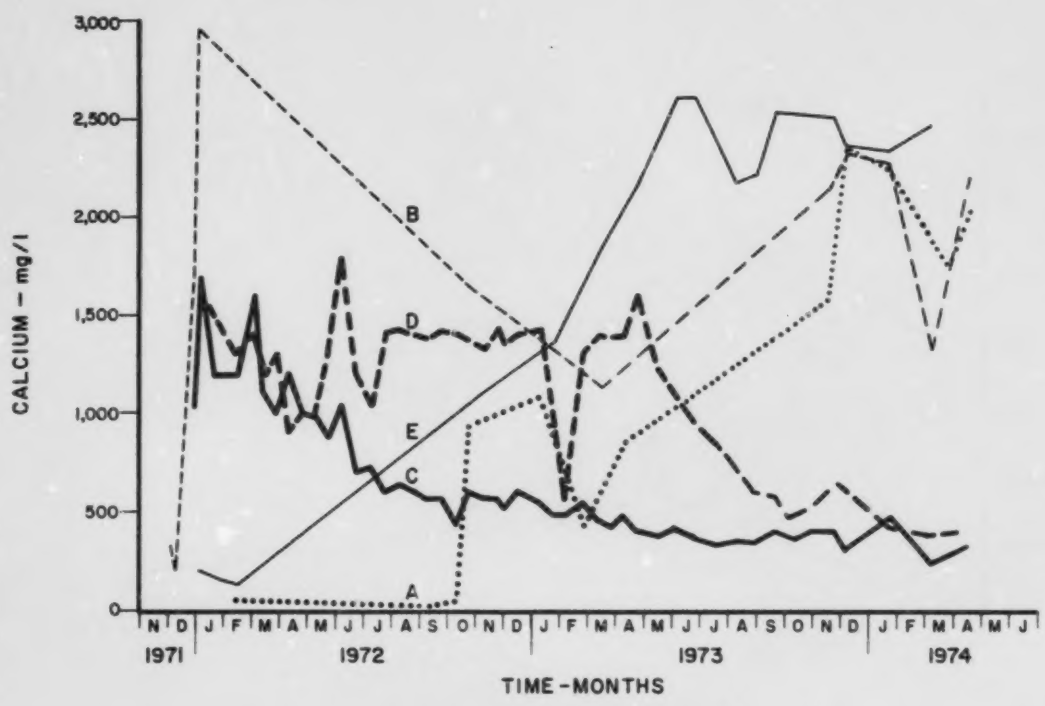
SODIUM CONCENTRATION OF LEACHATE

FIGURE 22



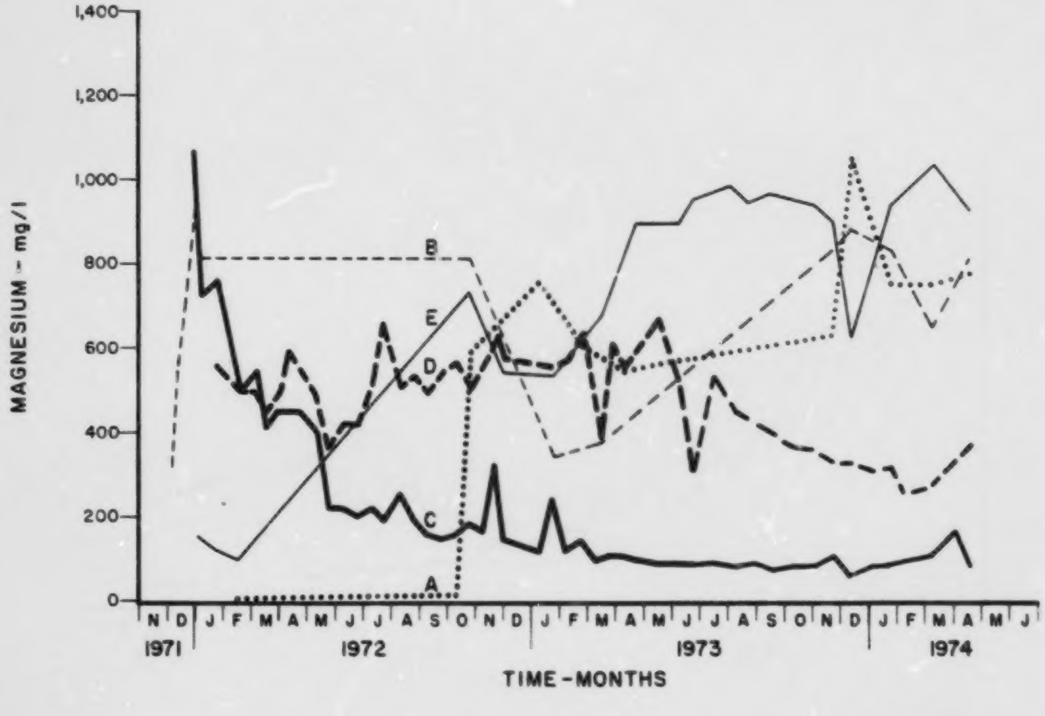
POTASSIUM CONCENTRATION OF LEACHATE

FIGURE 23



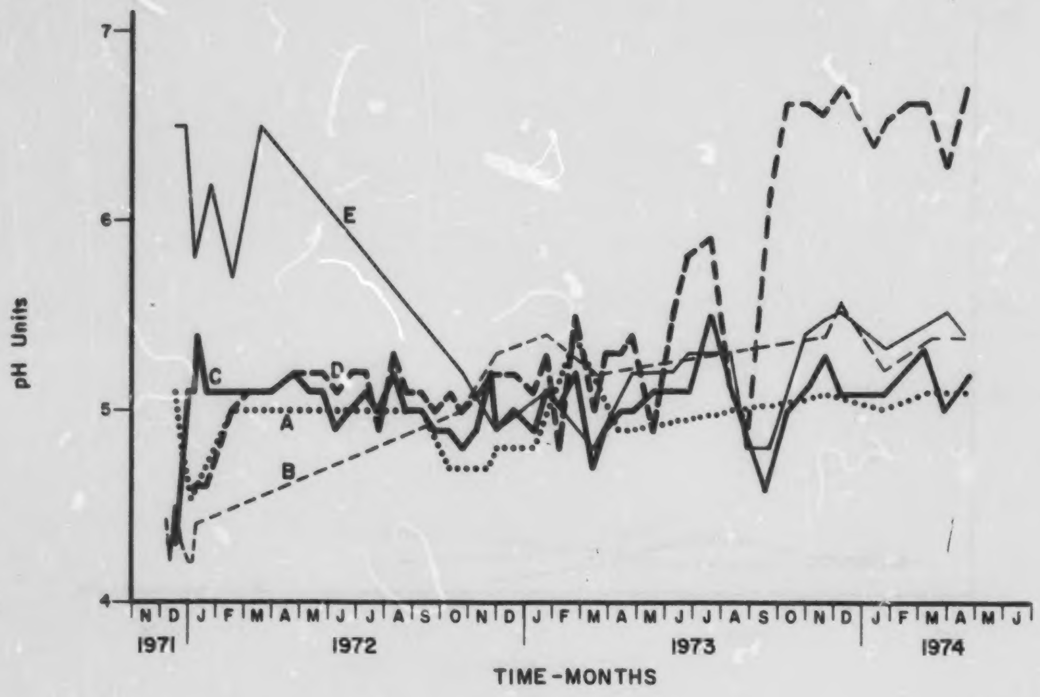
CALCIUM CONCENTRATION OF LEACHATE

FIGURE 24



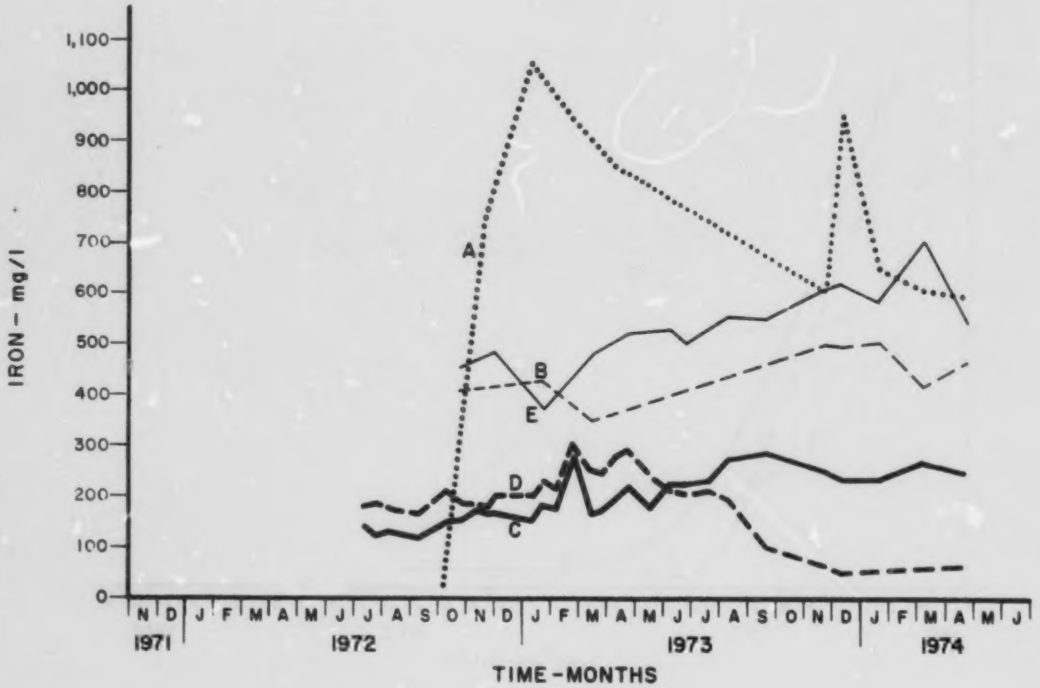
MAGNESIUM CONCENTRATION OF LEACHATE

FIGURE 25



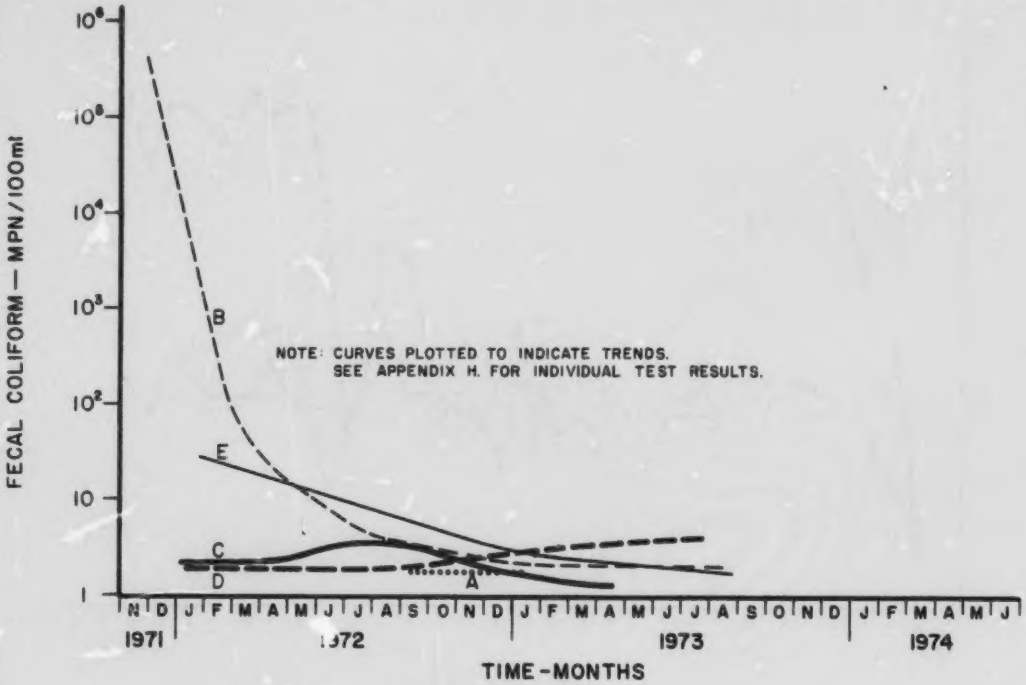
pH OF LEACHATE

FIGURE 26



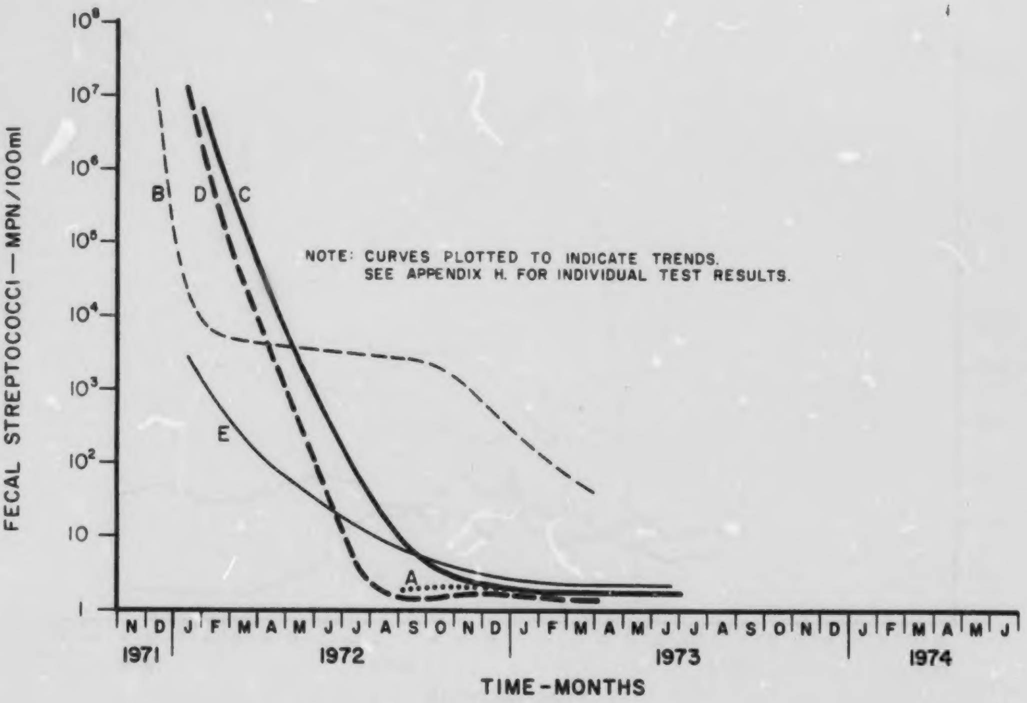
IRON CONCENTRATION OF LEACHATE

FIGURE 27



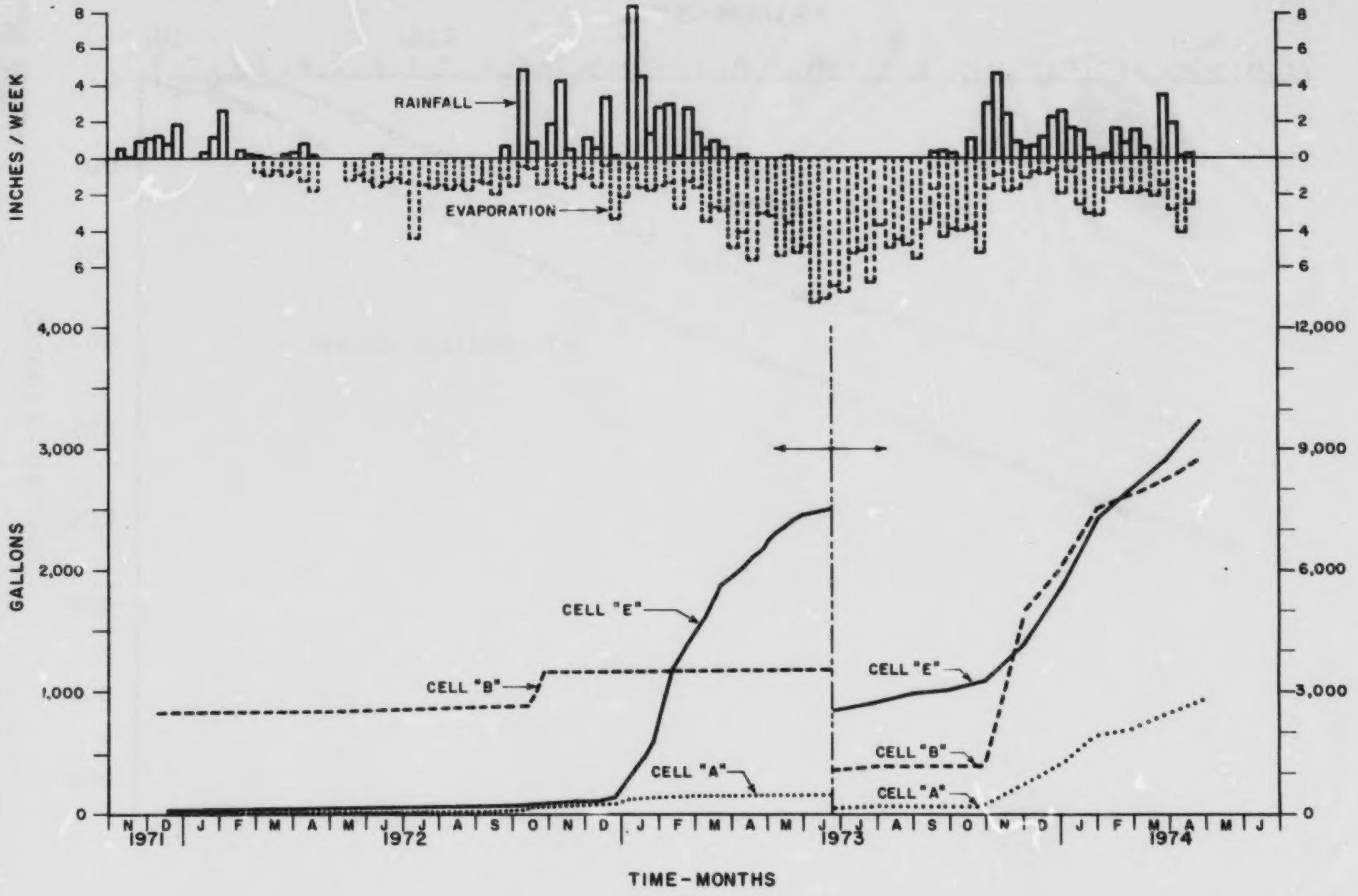
FECAL COLIFORM COUNT IN LEACHATE

FIGURE 28



FECAL STREPTOCOCCI COUNT IN LEACHATE

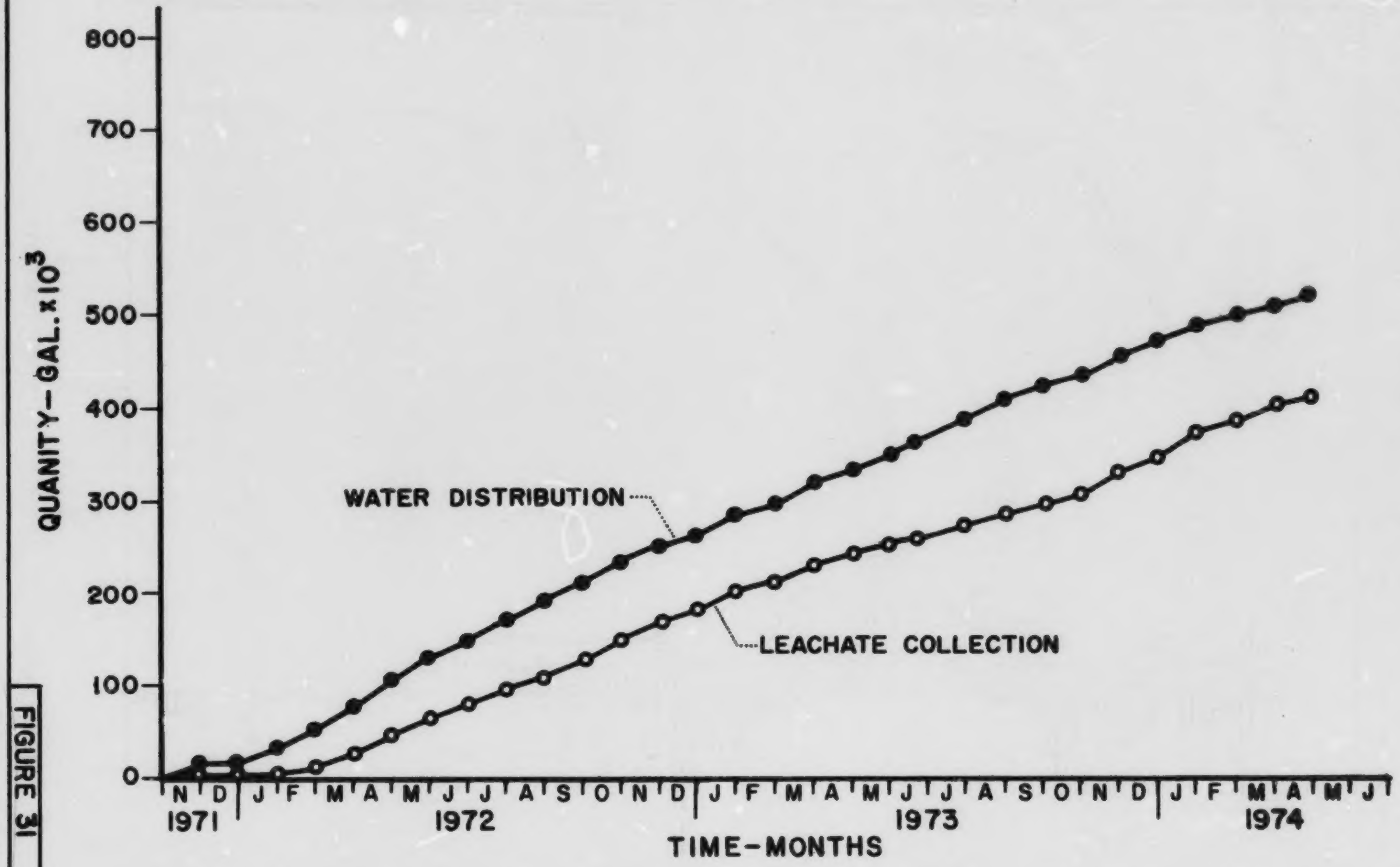
FIGURE 29



CUMULATIVE LEACHATE PRODUCTION - CELLS A, B & E

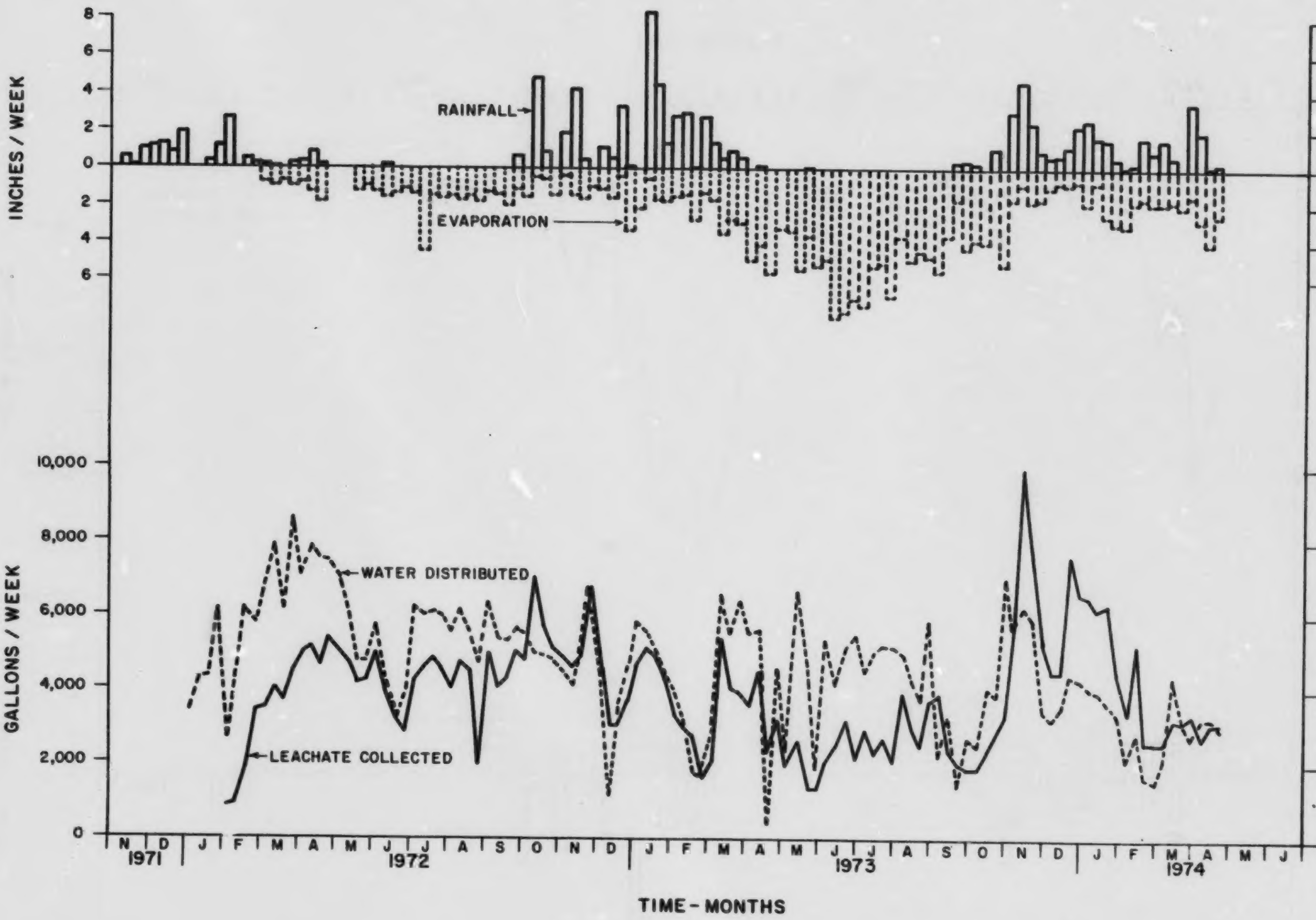
FIGURE 30

PROJECT 102-1.3



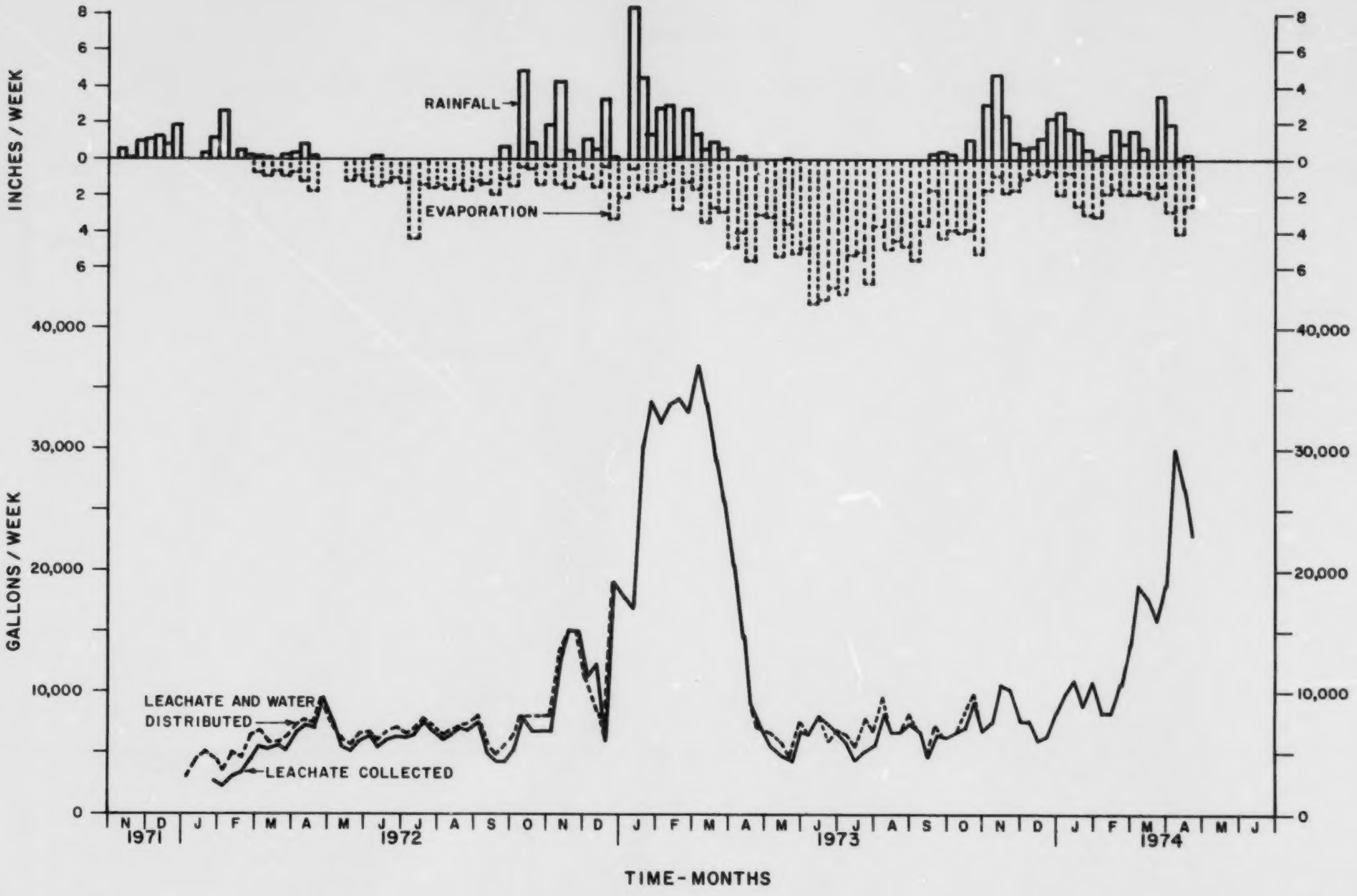
CUMMULATIVE WATER DISTRIBUTION AND LEACHATE COLLECTION—CELL "C"

FIGURE 31



FLUID ROUTING - CELL "C"

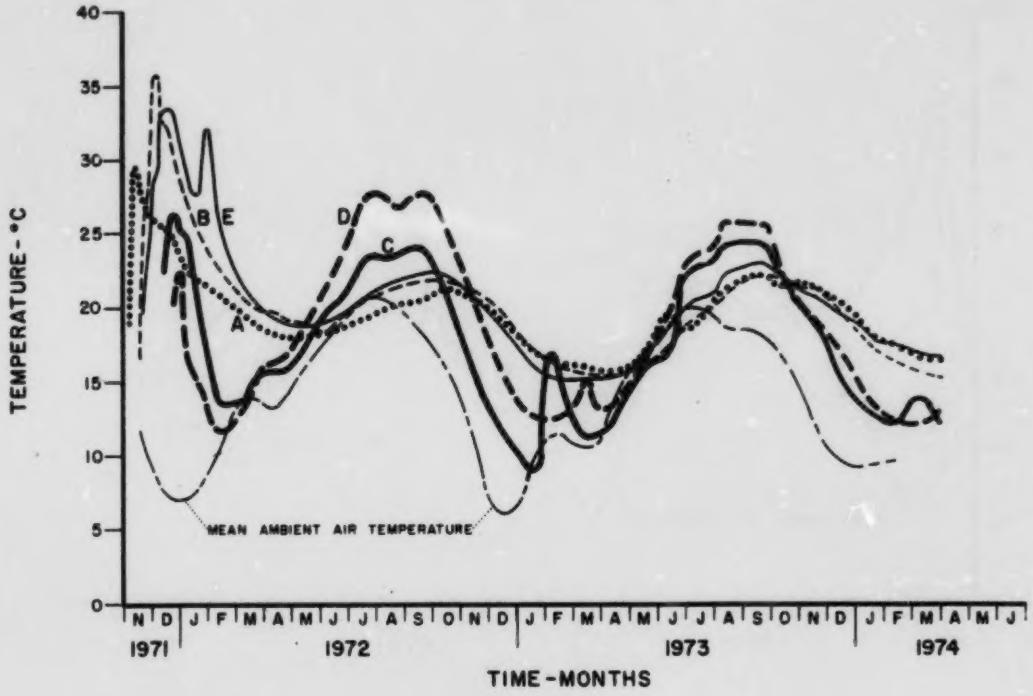
FIGURE 32



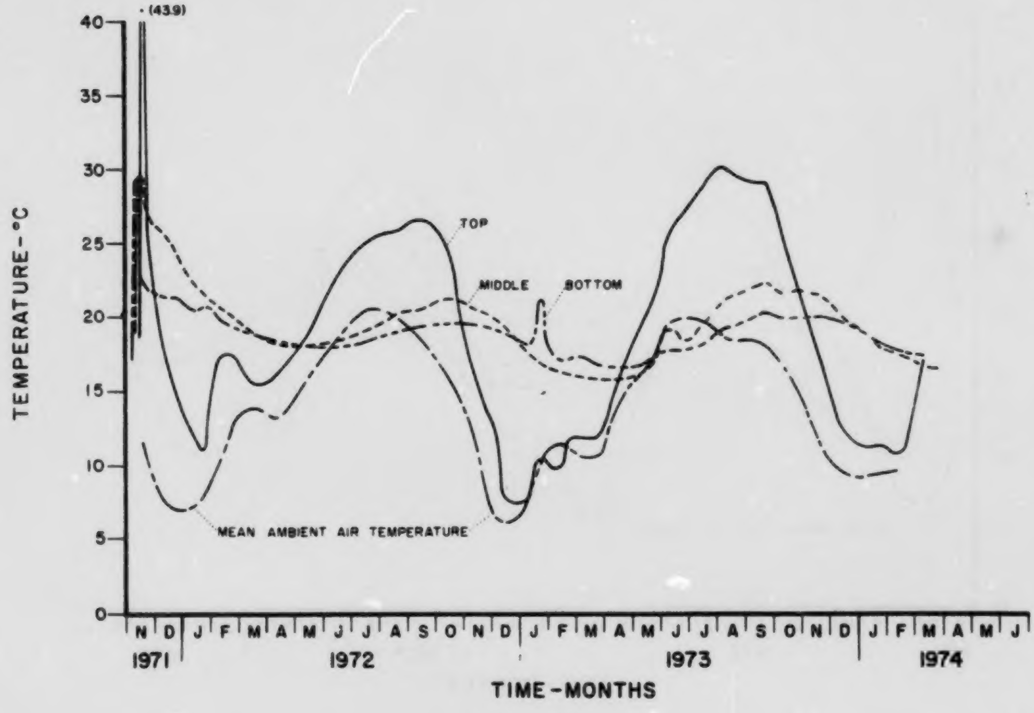
FLUID ROUTING - CELL "D"

FIGURE 33

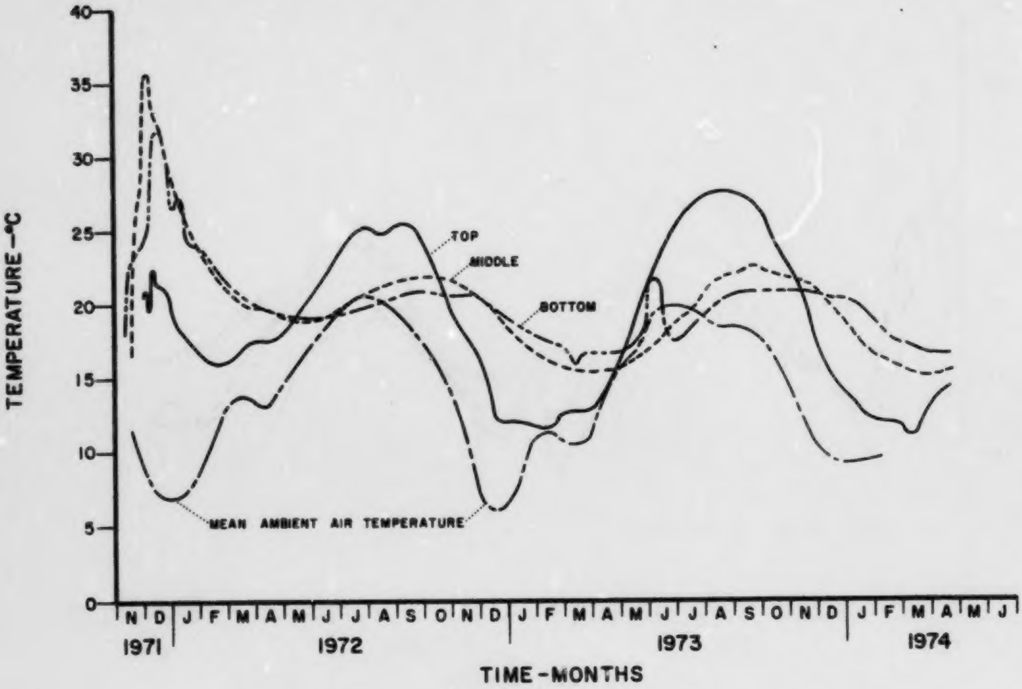
PROJECT 102-1.3



MIDDLE THERMISTOR TEMPERATURES – CELLS "A-E" FIGURE 34

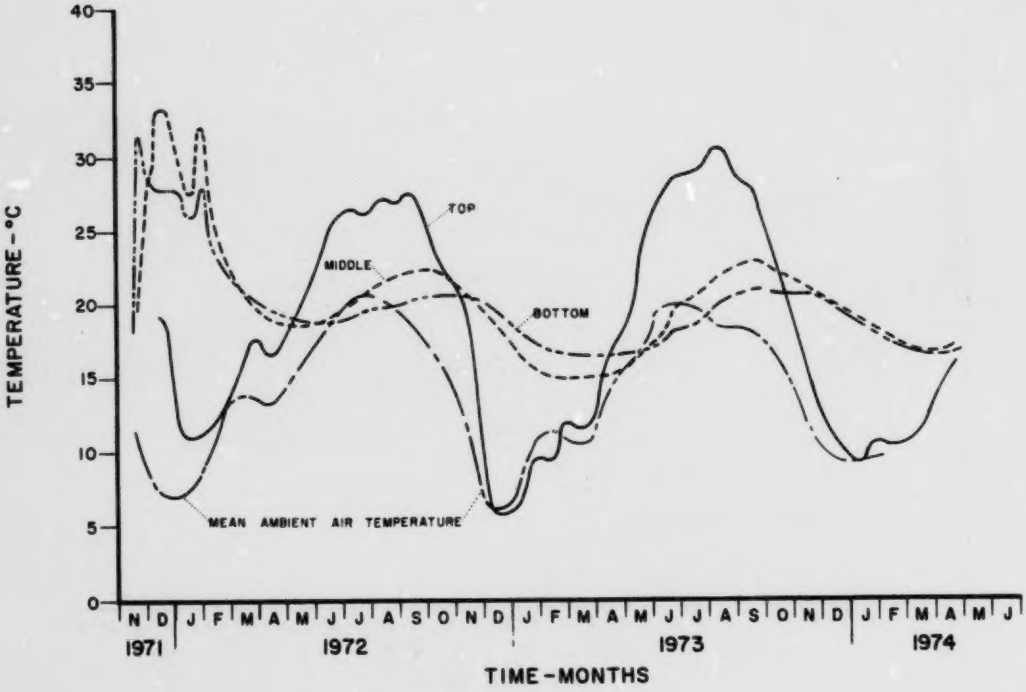


THERMISTOR TEMPERATURES – CELL "A" FIGURE 35



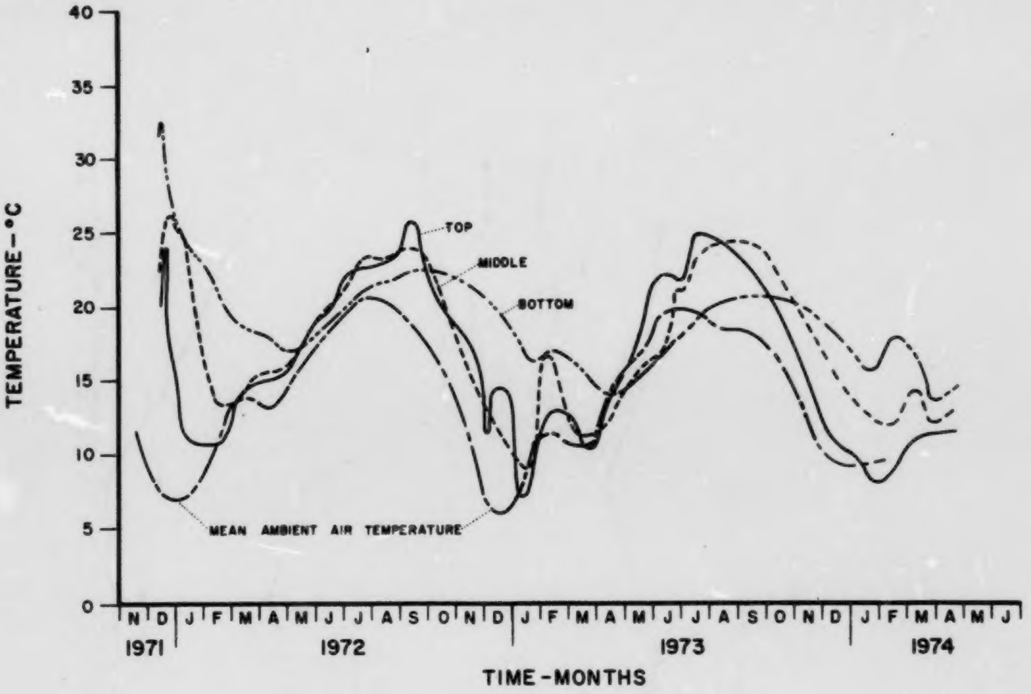
THERMISTOR TEMPERATURES-CELL "B"

FIGURE 36



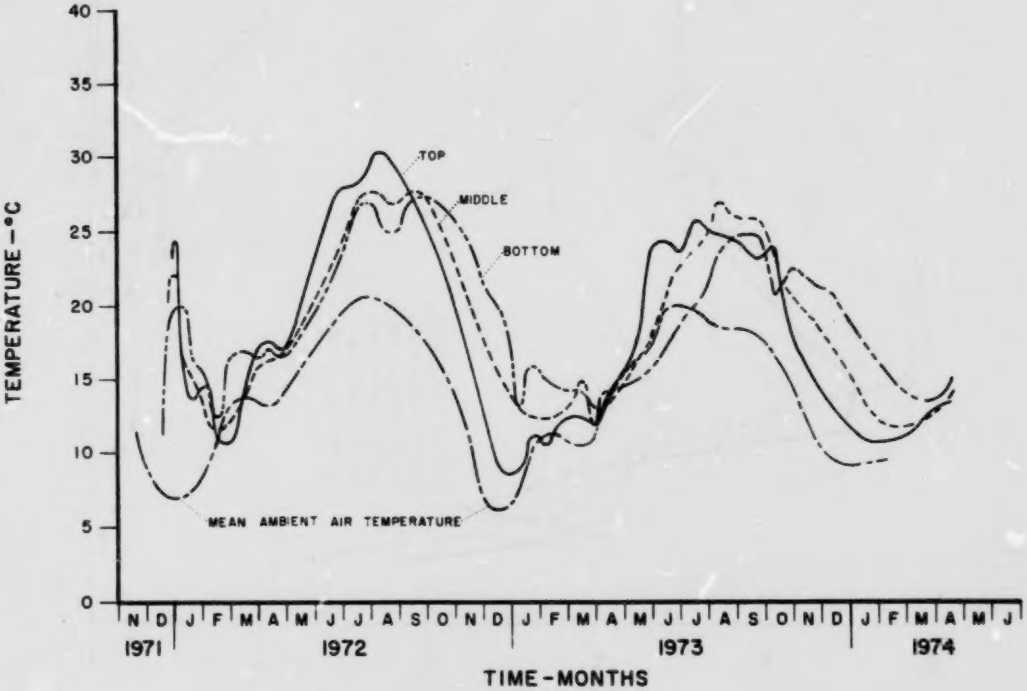
THERMISTOR TEMPERATURES-CELL "E"

FIGURE 37



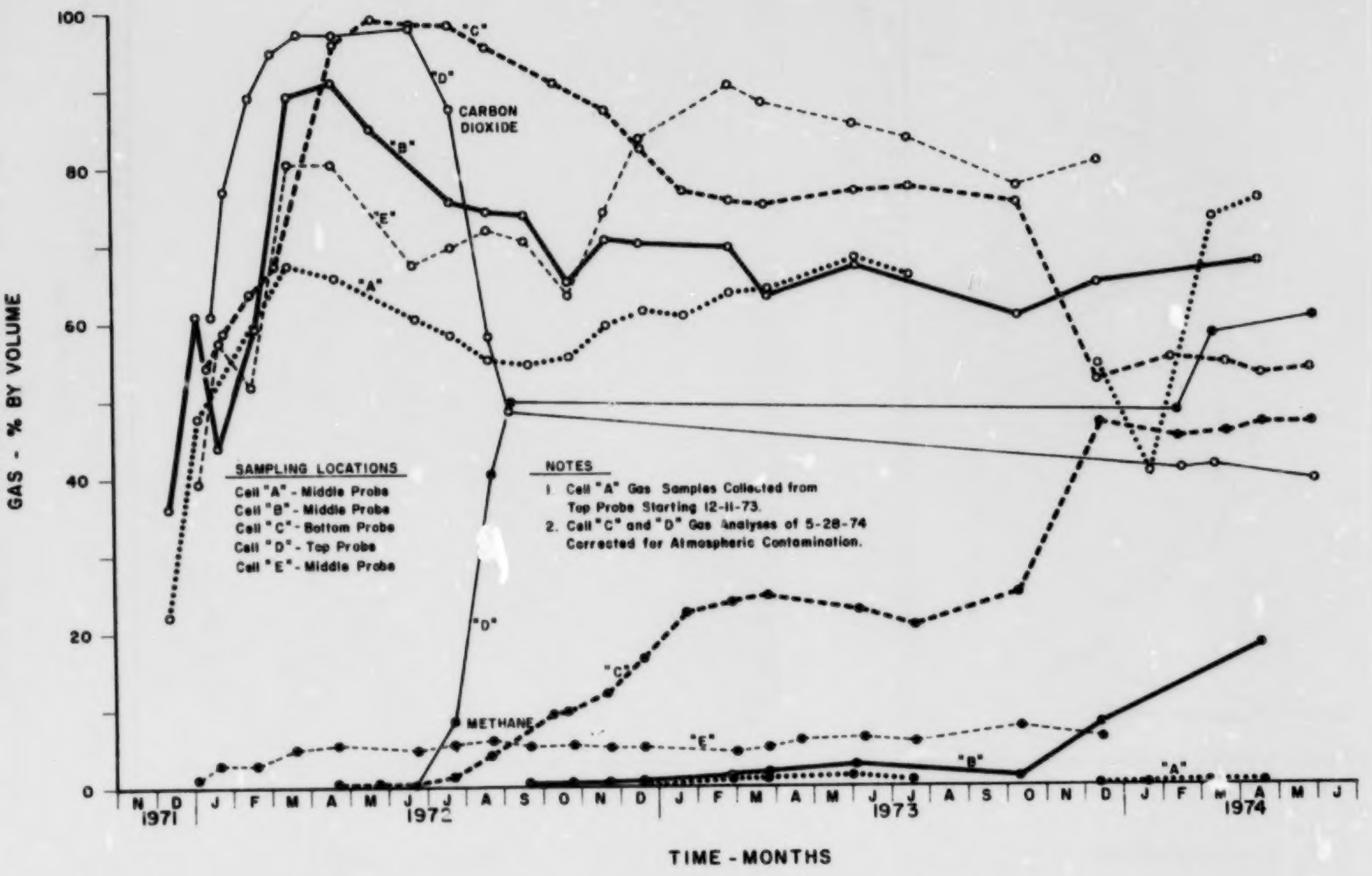
THERMISTOR TEMPERATURES—CELL "C"

FIGURE 38



THERMISTOR TEMPERATURES—CELL "D"

FIGURE 39



SAMPLING LOCATIONS

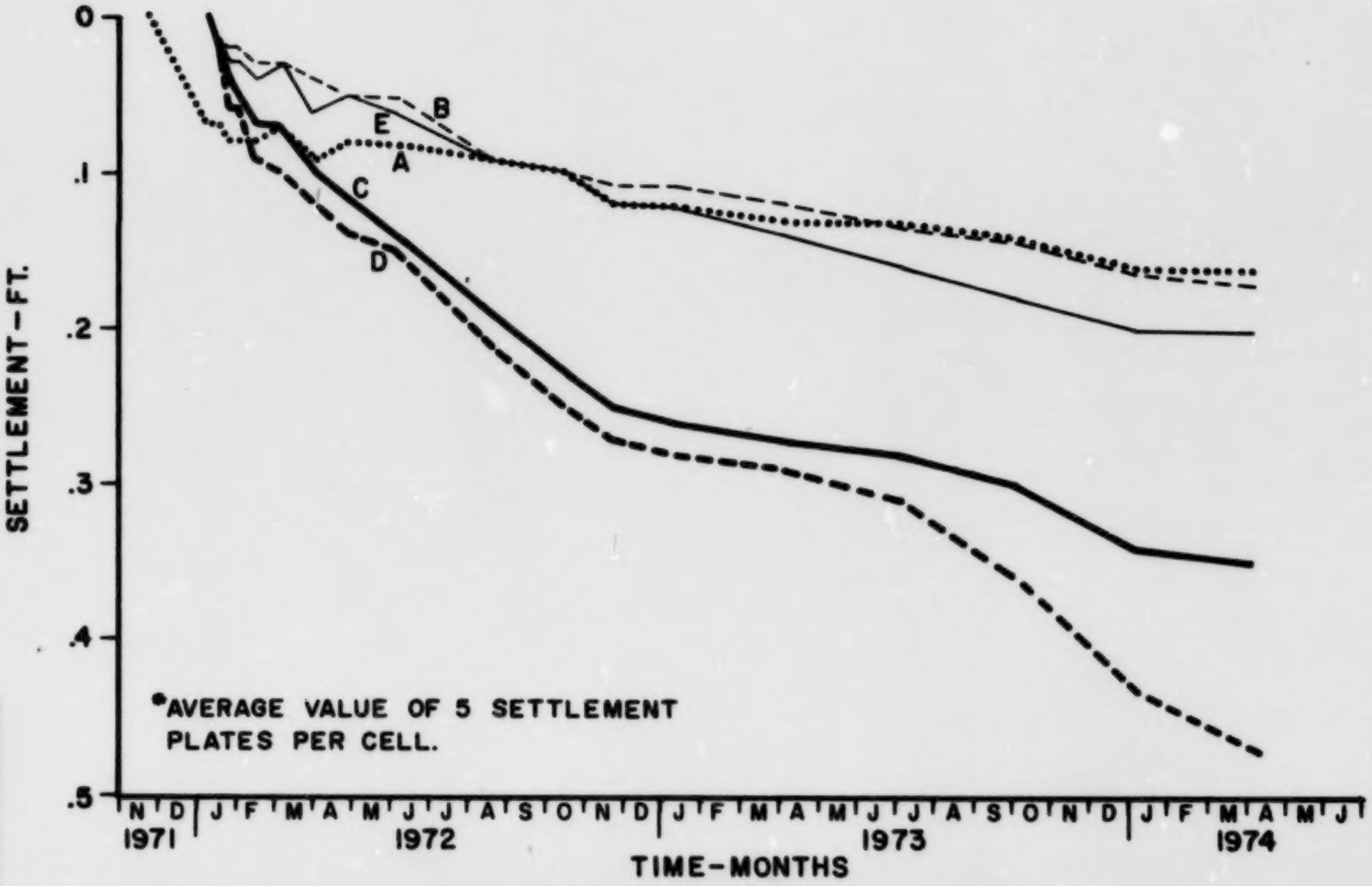
Cell "A" - Middle Probe
Cell "B" - Middle Probe
Cell "C" - Bottom Probe
Cell "D" - Top Probe
Cell "E" - Middle Probe

NOTES

1. Cell "A" Gas Samples Collected from Top Probe Starting 12-11-73.
2. Cell "C" and "D" Gas Analyses of 5-28-74 Corrected for Atmospheric Contamination.

GAS COMPOSITION

FIGURE 40



*AVERAGE VALUE OF 5 SETTLEMENT PLATES PER CELL.

*AVERAGE CELL SETTLEMENT

FIGURE 41

APPENDIX A

FIELD EXPLORATION AND LABORATORY TESTING

LOG OF EXPLORATORY BORING

GROUND SURFACE ELEVATION: FEET **BORING NO.** 1

Tor-vane	Liquid Limit	Plasticity Index	Natural Moisture Content Percent	Dry Density Lbs./Cu.Ft.	* Penetration	Depth in Feet	Ground Water Levels	Samples		DESCRIPTION
									▨	(CL) Yellow Brown Sandy CLAY with roots to 8 inches; dry, hard.
						2			▨	(Damp, very stiff to hard)
1.0	38	21	12.8		4.5+			X	▨	
						4			▨	(SC) Yellow Orange Clayey SAND with trace of fine gravel @ 4.0'; moist, stiff.
	31	14	15.6					X	▨	
1.0					4.5+	6			▨	(Firm)
						8			▨	(Mottled gray with gravel to ½ inch in lense; very moist)
			15.7			10		X	▨	(Blue-green, wet)
										Bottom of Trench- 11.0 feet.
						12				

REMARKS: Trench excavated with Drott Backhoe.

X - Indicates bulk sample obtained from trench

* - Penetration by pocket penetrometer

By J.C. Date 7-8-71 Checked By

Project No. 102-1.3 Client Sonoma County Location Sonoma County, California

FE 1 (8-71)

PLATE A-1

LOG OF EXPLORATORY BORING

GROUND SURFACE ELEVATION: **FEET** **BORING NO.** 2

Torvane	Liquid Limit	Plasticity Index	Natural Moisture Content Percent	Dry Density Lbs./Cu.Ft.	* Penetration	Depth in Feet	Ground Water Levels	Samples	DESCRIPTION
									(CL) Medium Brown Sandy CLAY with roots to 8 inches; dry, hard.
	30	15	11.3					X	
						2			(Damp, very stiff)
1.0					4.5				
						4			(Yellow brown with trace of fine gravel; grading damp to moist, stiff)
						6			
0.9					3.5				(Mottled orange and gray)
						8			
	29	15	18.7					X	
						10			(lense gravel to ½")
						12			Bottom of Trench - 11.5 feet.

REMARKS: Trench excavated with Drott Backhoe.

X - Indicates bulk sample obtained from trench

* - Penetration by pocket penetrometer

By J.C. **Date** 7-8-71 **Checked By** **Location** Sonoma County, California

Project No. 102-1.3 **Client** Sonoma County

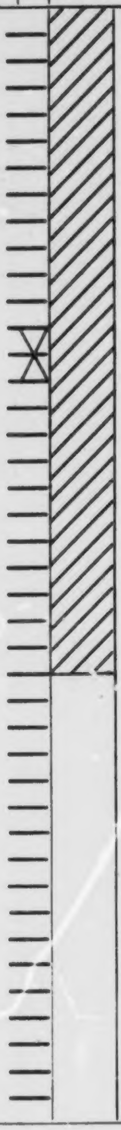
FE 1 (8-71)

PLATE A-2

LOG OF EXPLORATORY BORING

GROUND SURFACE ELEVATION: FEET **BORING NO.** 3

Tor-vane	Liquid Limit	Plasticity Index	Natural Moisture Content Percent	Dry Density Lbs./Cu.Ft.	* Penetration	Depth in Feet	Ground Water Levels	Samples	DESCRIPTION
									(CL) Medium Brown Sandy CLAY; grass roots to 8"; dry, hard (Traces of fine gravel)
0.4					4.5+	2			(Mottled orange; damp, very stiff)
						4			(Yellow brown, moist, stiff)
									(More sand)
			19.9			6		X	(Mottled orange and gray)
						8			
0.8					3.0	10			
						12			Bottom of Trench - 12.5 feet



REMARKS: Trench excavated with Drott Backhoe

X - Indicates bulk sample obtained from trench

* - Penetration by pocket penetrometer

By J.C. Date 7-8-71 Checked By Location Sonoma County, California

Project No. 102-1.3 Client Sonoma County

FE 1 (8-71(

PLATE A-3

LOG OF EXPLORATORY BORING

GROUND SURFACE ELEVATION: **FEET** **BORING NO.** 4

	Liquid Limit	Plasticity Index	Natural Moisture Content Percent	Dry Density Lbs./Cu.Ft.	* Penetration	Depth in Feet	Ground Water Levels	Samples		DESCRIPTION
									▨	(CL) Medium Brown Sandy CLAY with roots to 8"; dry, hard.
						2			▨	(Damp, very stiff)
						4			▨	(Mottled orange; moist, stiff)
								X	▨	(Very moist)
	30	17	18.3			6			▨	
						8			▨	
			20.2					X	▨	(Yellow brown; moist, stiff)
						10				Bottom of Trench - 9.5 feet

REMARKS:

Trench excavated with Drott Backhoe

X - Indicates bulk sample obtained from trench

* - Penetration by pocket penetrometer

By J. C. Date 7-8-71 Checked By Location Sonoma County, California

Project No. 102-1.3 Client Sonoma County

FE 1 (8-71)

PLATE A-4

LOG OF EXPLORATORY BORING

GROUND SURFACE ELEVATION: FEET **BORING NO.** 5

Tor-vane	Liquid Limit	Plasticity Index	Natural Moisture Content Percent	Dry Density Lbs./Cu.Ft.	☆ Penetration	Depth in Feet	Ground Water Levels	Samples	DESCRIPTION
									(CL) Medium Brown Sandy CLAY with roots to 8"; dry, hard
0.4					4.5+	2			(Mottled orange; damp, very stiff)
	39	24	15.6			4		X	(Yellow brown mottled orange; moist, stiff)
1.0+					4.5+	6			(Streaked gray)
						8		X	
			13.8						(Trace of fine gravel)
						10			
									Bottom of Trench - 11.0 feet
						12			

REMARKS:

Trench excavated with Drott Backhoe

X - Indicates bulk sample obtained from trench

☆ - Penetration by pocket penetrometer

By J.C. Date 7-8-71 Checked By

Project No. 102-1.3 Client Sonoma County Location Sonoma County, California

FE 1 (8-71)

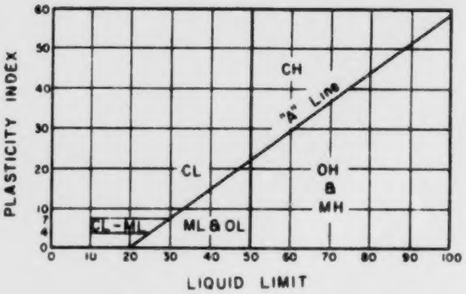
PLATE A-5

MAJOR DIVISIONS		SYMBOLS		TYPICAL SOIL DESCRIPTIONS
COARSE GRAINED SOILS (More than 1/2 of soil > no. 200 sieve size)	**GRAVELS** (More than 1/2 of coarse fraction > no. 4 sieve size)	GW	■	Well graded gravels or gravel-sand mixtures, little or no fines
		GP	⁘	Poorly graded gravels or gravel-sand mixtures, little or no fines
		GM	▩	Silty gravels, gravel-sand-silt mixtures
		GC	▩	Clayey gravels, gravel-sand-clay mixtures
	SANDS (More than 1/2 of coarse fraction < no. 4 sieve size)	SW	▒	Well graded sands or gravelly sands, little or no fines
		SP	░	Poorly graded sands or gravelly sands, little or no fines
		SM	▥	Silty sands, sand-silt mixtures
		SC	▨	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS (More than 1/2 of soil < no. 200 sieve size)	**SILTS & CLAYS** LL < 50	ML	▥	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	▨	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	■	Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS LL > 50	MH	▥	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	▨	Inorganic clays of high plasticity, fat clays
		OH	▨	Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS		Pt	▒	Peat and other highly organic soils

CLASSIFICATION CHART
(Unified Soil Classification System)

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL coarse fine	3" to No. 4 3" to 3/4" 3/4" to No. 4	76.2 to 4.76 76.2 to 19.1 19.1 to 4.76
SAND coarse medium fine	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.074 4.76 to 2.00 2.00 to 0.420 0.420 to 0.074
SILT & CLAY	Below No. 200	Below 0.074

GRAIN SIZE CHART



PLASTICITY CHART

METHOD OF SOIL CLASSIFICATION

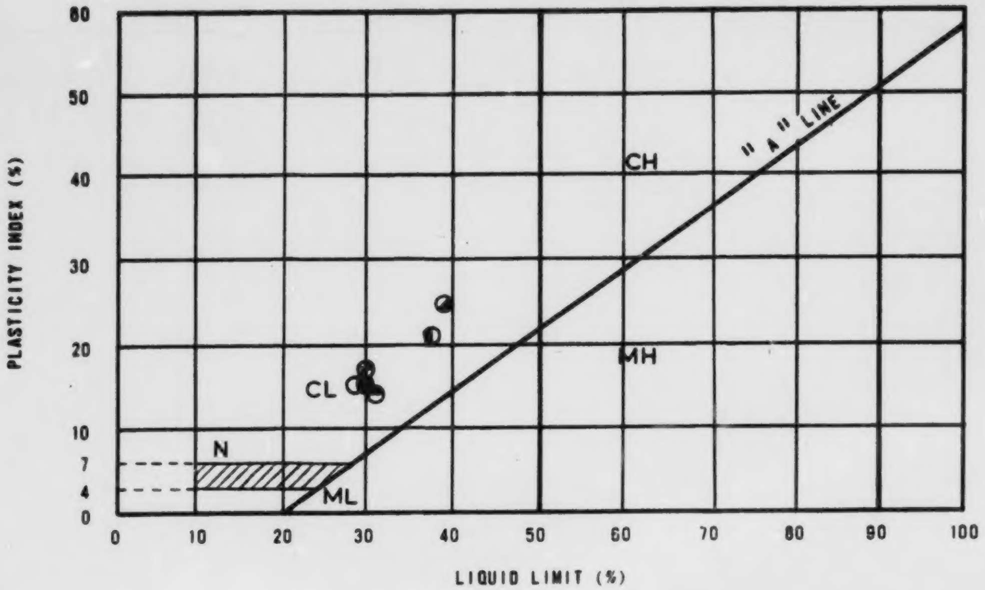
SUMMARY OF PERMEABILITY TESTS

TRENCH NO.	DEPTH ft.	DENSITY pcf	PERMEABILITY @ 20°C cm/sec	PERMEABILITY - ft./year
1	2.5-3.0	106.0	6.6×10^{-8}	0.066
4	5.5	112.4	2.3×10^{-7}	0.23
5	4.0	104.9	3.1×10^{-7}	0.31

SUMMARY OF SPECIFIC GRAVITY

TRENCH NO.	DEPTH ft.	SPECIFIC GRAVITY
1	2.5-3.0	2.78
	4.5-5.0	2.58

PLASTICITY CHART



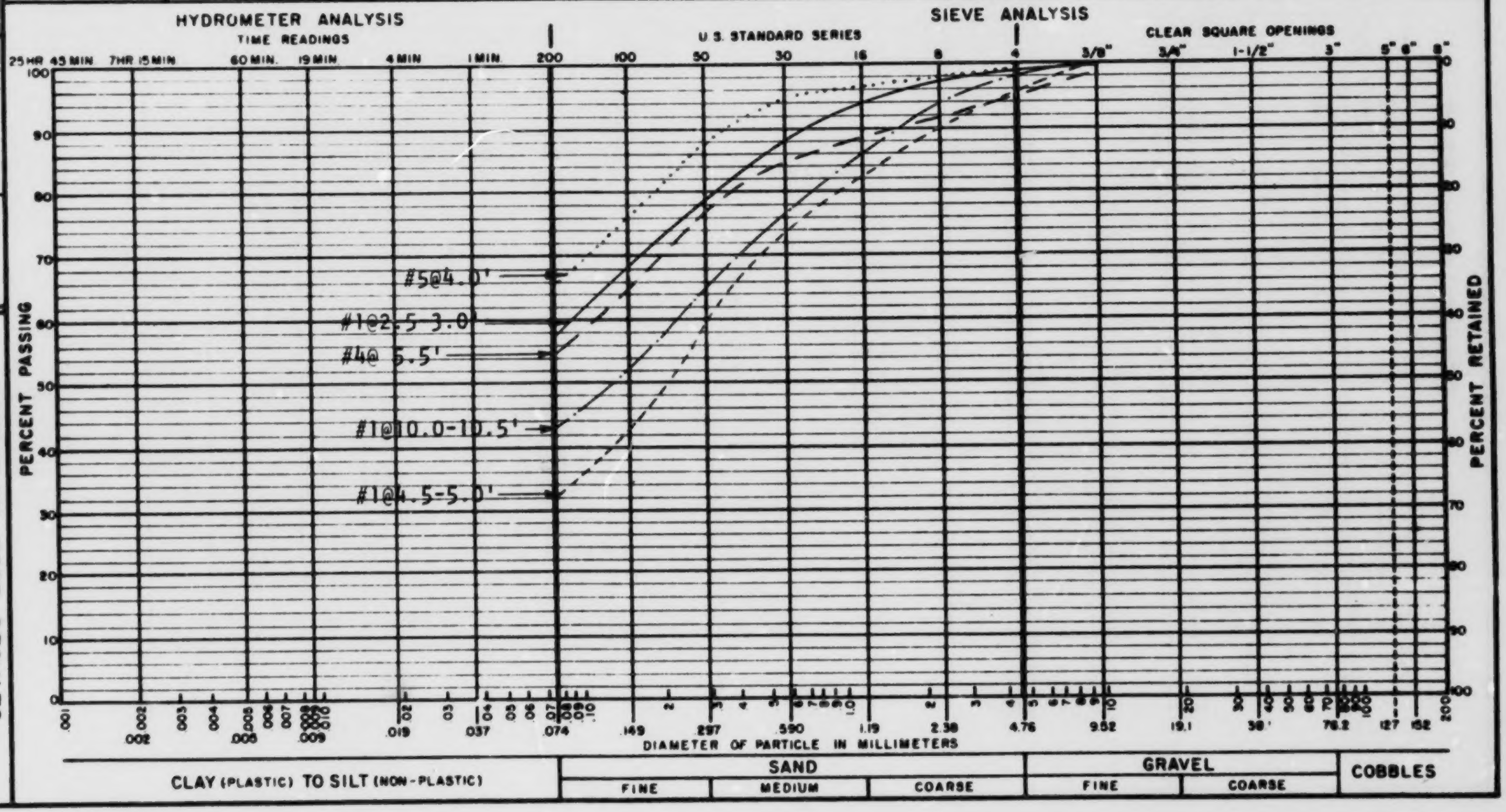
PLASTICITY DATA

KEY SYMBOL	HOLE NO	DEPTH (feet)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	UNIFIED SOIL CLASSIFICATION SYMBOL
◐	1	2.5-3.0	38	21	CL
◒		4.5-5.0	31	14	SC
●	2	1.0-1.5	30	15	CL
○		8.0-9.0	29	15	CL
⊕	4	5.5	30	17	CL
◕	5	4.0	39	24	CL

Project 107-1.2

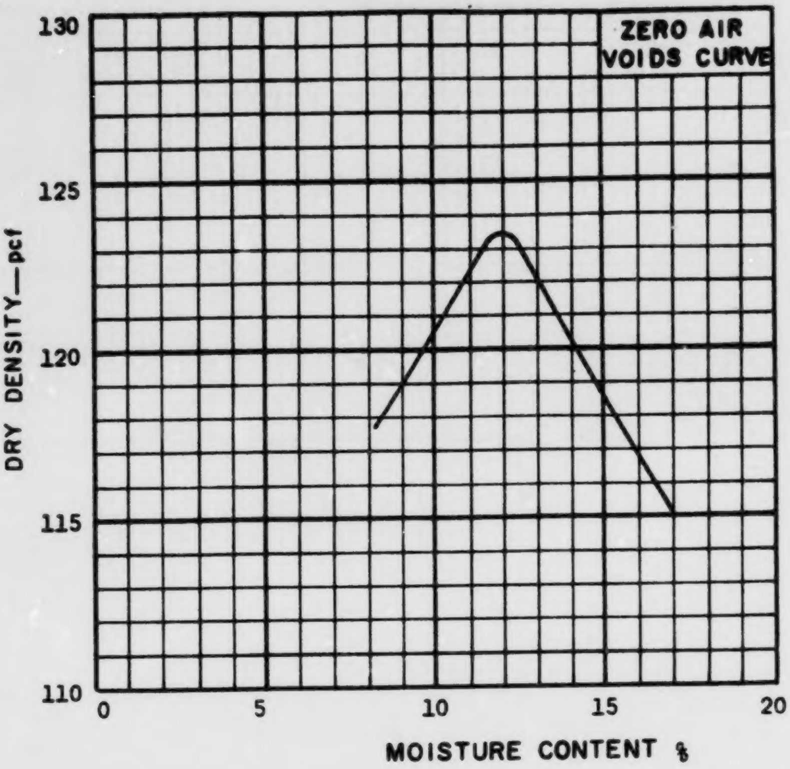
PLATE A-8

LL	38	31	-	30	29	-	30	-	39	-
PL	17	17	-	15	14	-	13	-	15	-
PI	21	14	-	15	15	-	17	-	24	-
NAT. W/C	12.8	15.6	15.7	11.3	18.7	19.9	18.3	20.2	15.6	13.8
CLASSIF. SYMB.	CL	SC	SC	CL	CL		CL	CL	CL	-
SAMPLE NO.	1	2	3	1	2	1	1	2	1	2
DEPTH FT	2.5-3.0	4.5-5.0	10.0-10.5	1.0-1.5	8.0-9.0	6.0-7.0	5.5	9.0	4.0	8.5
HOLE NO.	1	1	1	2	2	3	4	4	5	5



Tested By EK	Appr By JGP	Date	GRADATION TEST RESULTS
Hole No. -	Area		Job No. 102-1.3 File No. Fig No.

COMPACTION TEST



SAMPLE NO.
1

SAMPLE DEPTH
2.5' - 3.0'

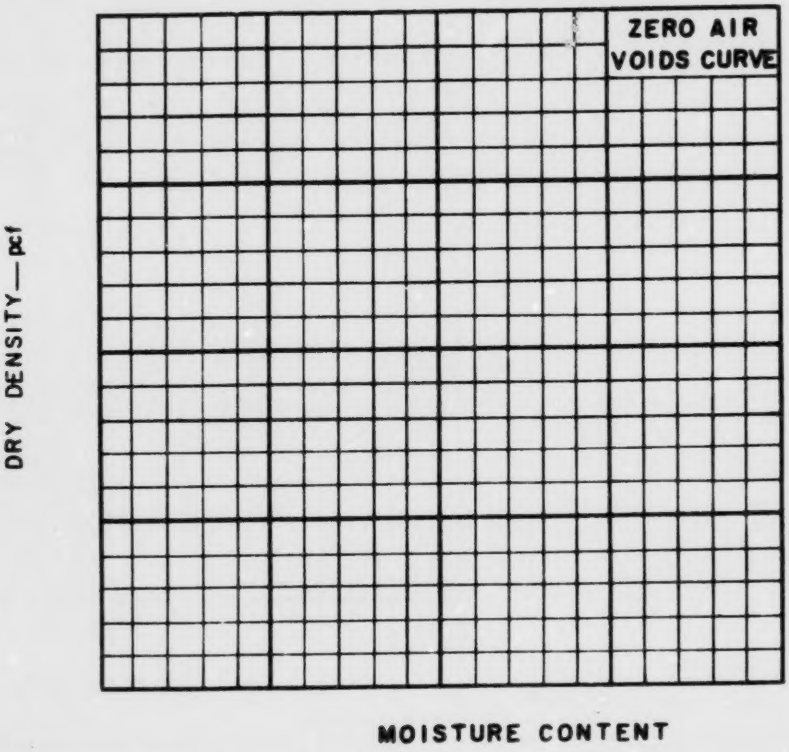
SAMPLE DESCRIPTION
Brown Sandy
CLAY

SPECIFIC GRAVITY
2.78

TEST DESIGNATION
D1557-70

MAXIMUM DRY DENSITY (pcf)
123.5

OPTIMUM MOISTURE CONTENT, %
12.0



SAMPLE NO.

SAMPLE DEPTH

SAMPLE DESCRIPTION

SPECIFIC GRAVITY

TEST DESIGNATION

MAXIMUM DRY DENSITY (pcf)

OPTIMUM MOISTURE CONTENT, %

PROJECT NO. 102-1.3

PLATE A-10

APPENDIX B

TEST CELL CONSTRUCTION DATA

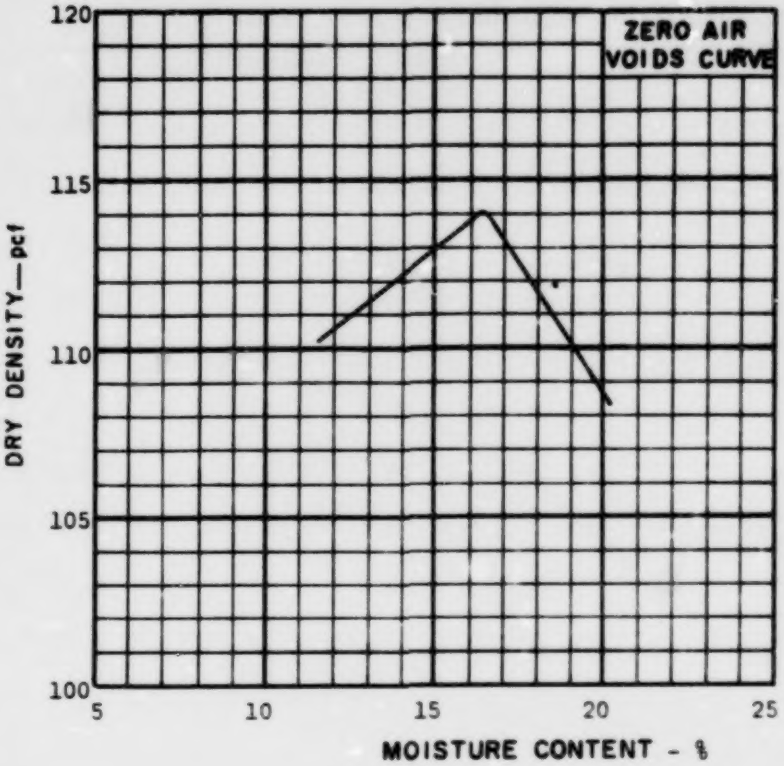
TABLE A

SUMMARY OF FIELD DENSITY TEST RESULTS

TEST NO.	DATE OF TEST	APPROX. DEPTH OF FILL (feet)	LOCATION	APPROX. ELEVATION ((feet))	FIELD		MAXIMUM LAB DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	REMARKS
					DRY DENSITY (pcf)	WATER CONTENT (%)			
1	1971 10-1	2.0	See Plot Plan	297.0	113.0	13.0	114.0	99.0	Cells B,C,D
2	10-1	2.0	See Plot Plan	297.0	115.5	13.6	114.0	101.5	Cells B,C,D
3	10-6	3.0	See Plot Plan	298.0	110.0	13.5	114.0	96.5	Cells B,C,D
4	10-8	4.5	See Plot Plan	299.5	118.0	15.0	114.0	103.5	Cells B,C,D
5	10-11	5.5	See Plot Plan	300.5	110.0	15.6	114.0	97.0	Cells B,C,D
6	10-18	4.5	See Plot Plan	300.5	115.0	18.6	114.0	102.0	Cells B,C,D
7	10-18	3.5	See Plot Plan	301.5	113.0	19.2	114.0	99.0	Cells B,C,D
8	10-18	2.5	See Plot Plan	302.5	119.5	11.3	114.0	105.0	Cells B,C,D
9	10-18	2.0	See Plot Plan	303.0	106.0	21.2	114.0	93.0	Cells B,C,D
10	10-18	1.0	See Plot Plan	304.0	114.0	17.1	114.0	100.0	Cells B,C,D
11	10-18	1.0	See Plot Plan	304.0	115.2	19.5	114.0	101.0	Cells B,C,D
12	10-18	2.0	See Plot Plan	303.0	109.0	19.2	114.0	96.0	Cells B,C,D
13	10-18	1.5	See Plot Plan	277.5	121.2	11.7	114.0	106.0	Cells A & E
14	10-18	2.0	See Plot Plan	277.0	113.2	18.8	114.0	99.5	Cells A & E
15	10-18	1.0	See Plot Plan	278.0	110.2	16.2	114.0	97.0	Cells A & E
16	10-18	5.0	See Plot Plan	275.5	115.0	10.9	114.0	101.0	Cells A & E
17	10-18	5.0	See Plot Plan	275.0	111.0	17.1	114.0	97.5	Cells A & E
18	10-18	5.0	See Plot Plan	276.5	108.0	20.8	114.0	94.5	Re-worked & Accepted
19	10-18	0.0	See Plot Plan	278.0	110.5	14.0	114.0	97.0	Cells A & E

PROJECT NO. 102-1.3

COMPACTION TEST



SAMPLE NO.
Stockpile

SAMPLE DEPTH
-

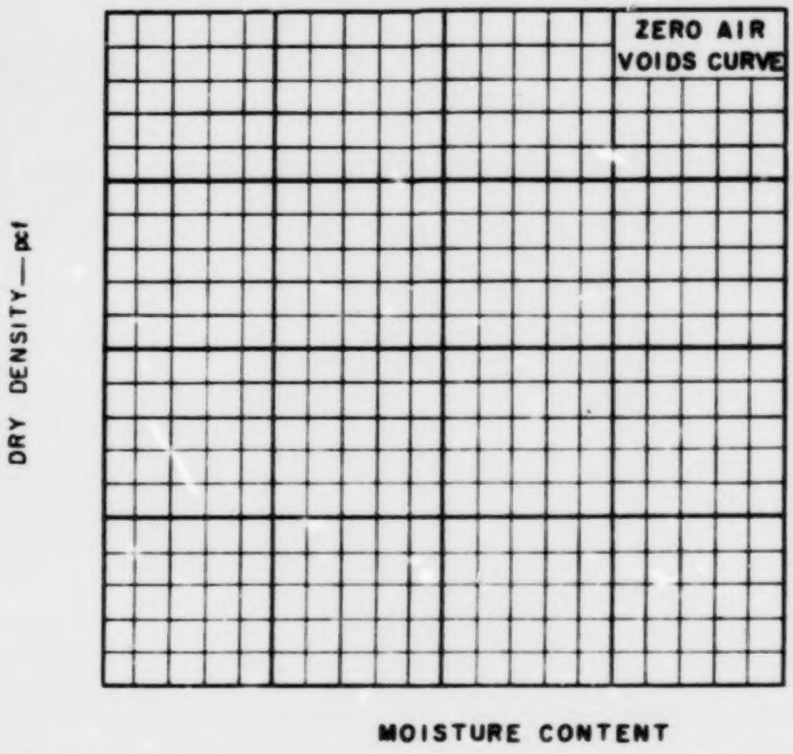
SAMPLE DESCRIPTION
Brown clayey
fine SAND

SPECIFIC GRAVITY
2.75 (est.)

TEST DESIGNATION
D 698-70

MAXIMUM DRY DENSITY (pcf)
114.0

OPTIMUM MOISTURE CONTENT, %
16.3



SAMPLE NO.

SAMPLE DEPTH

SAMPLE DESCRIPTION

SPECIFIC GRAVITY

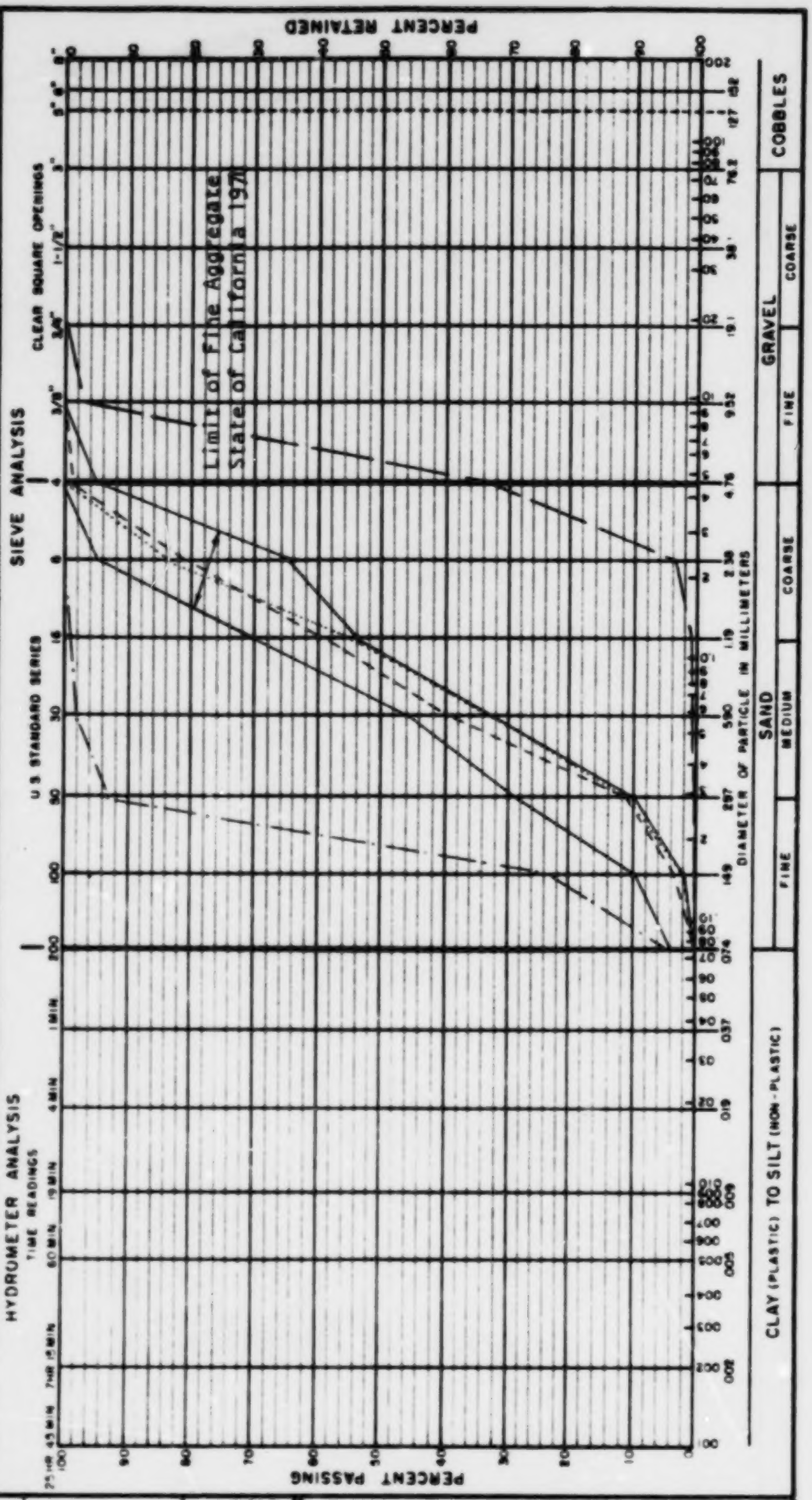
TEST DESIGNATION

MAXIMUM DRY DENSITY (pcf)

OPTIMUM MOISTURE CONTENT, %

PROJECT NO. 102-1.3

SYMBOL	········	— — — —	—·—·—	———					
LL									
PL									
PI									
NAT W/C									
CLASSIF SYMB									
SAMPLE NO.	Concrete Sand	Concrete Sand	Muck Sand	Pea Gravel					
DEPTH FT									
HOLE NO	Kaiser	Basalt	Basalt	Cell D					

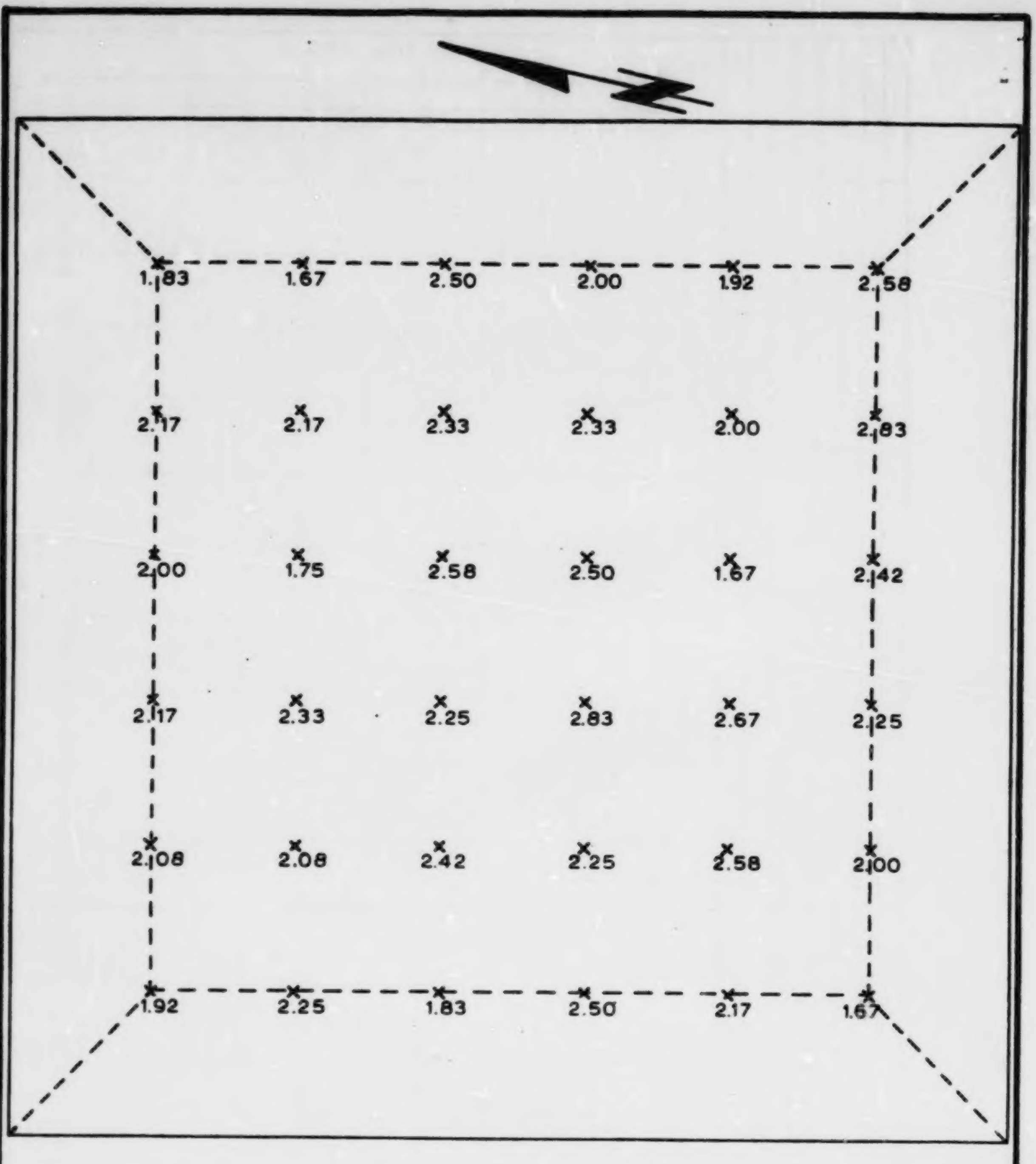


Tested By JGP	Appr By	Date 9/27	GRADATION TEST RESULTS
Hole No	Area	Job No 102-1.3	File No / Fig No

PLATE B-3

By GNM Date 1-72 Checked By RL Location

Project Number 102-1.3 Client Sonoma County



1.83 1.67 2.50 2.00 1.92 2.58
2.17 2.17 2.33 2.33 2.00 2.83
2.00 1.75 2.58 2.50 1.67 2.42
2.17 2.33 2.25 2.83 2.67 2.25
2.08 2.08 2.42 2.25 2.58 2.00
1.92 2.25 1.83 2.50 2.17 1.67

CELL 'A'
COVER THICKNESS IN FEET

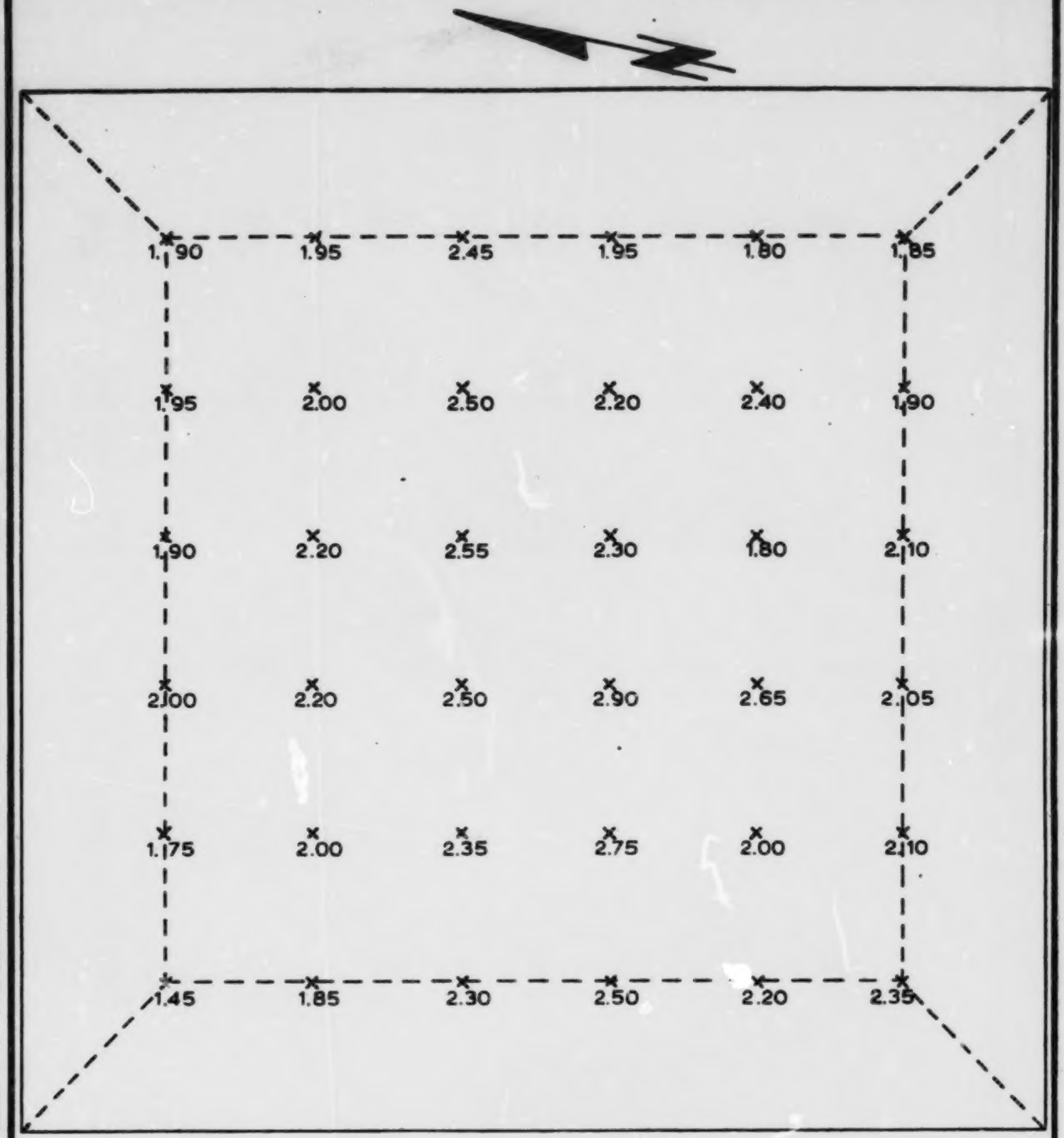
SCALE: 1 inch = 10 feet

TI 1(8-71)

PLATE B-4

By GNM Date 1-72 Checked By RR

Project Number 102-1.3 Client Sonoma County Location



1.90	1.95	2.45	1.95	1.80	1.85
1.95	2.00	2.50	2.20	2.40	1.90
1.90	2.20	2.55	2.30	1.80	2.10
2.00	2.20	2.50	2.90	2.65	2.05
1.75	2.00	2.35	2.75	2.00	2.10
1.45	1.85	2.30	2.50	2.20	2.35

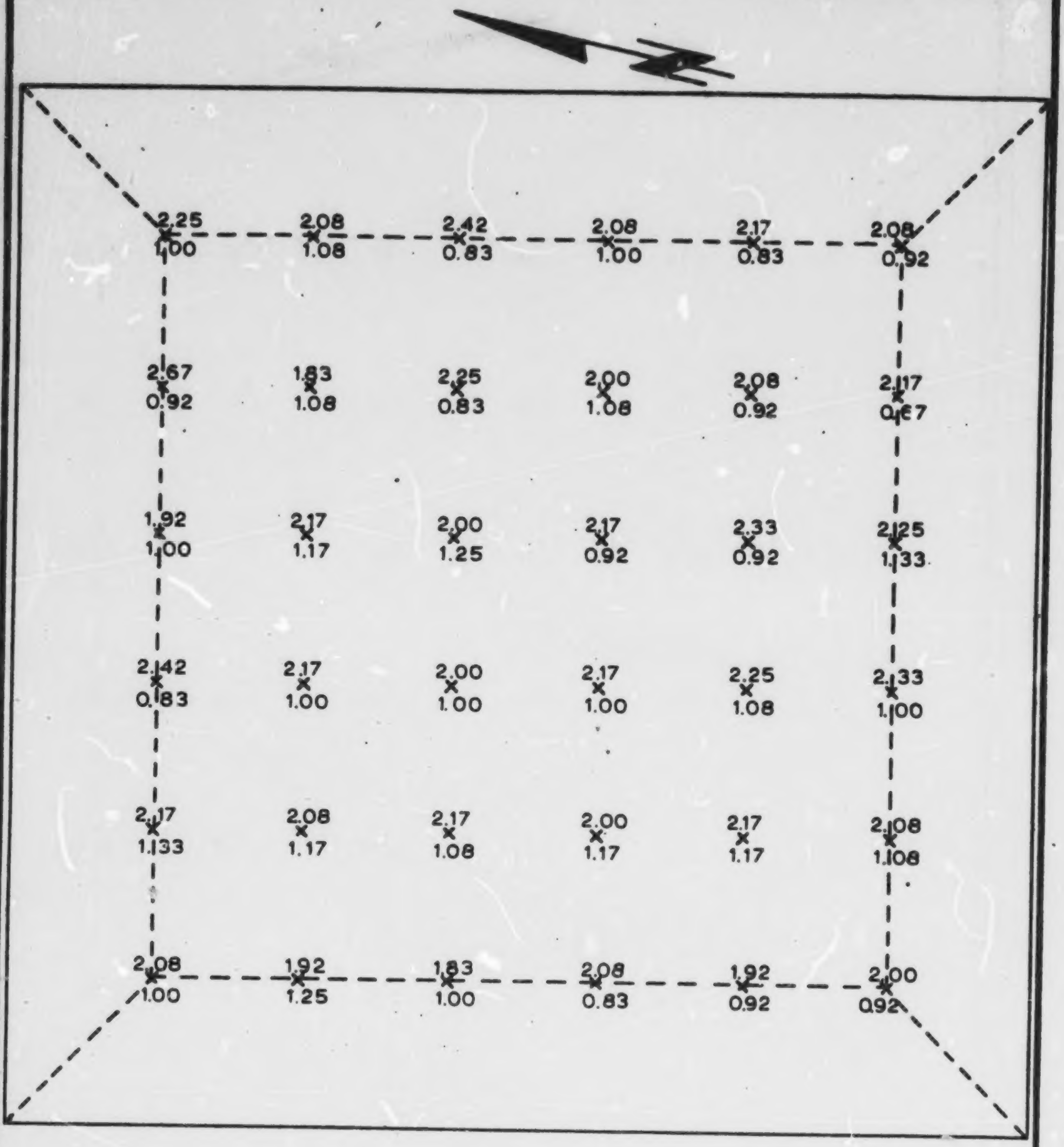
CELL 'B'
COVER THICKNESS IN FEET

SCALE: 1 inch = 10 feet

11 1(8-71)

By GNM Date 1-72 Checked By RL Location

Project Number 102-1.3 Client Sonoma County


2.25 × 1.00
2.08 × 1.08
2.42 × 0.83
2.08 × 1.00
2.17 × 0.83
2.08 × 0.92
2.67 × 0.92
1.83 × 1.08
2.25 × 0.83
2.00 × 1.08
2.08 × 0.92
2.17 × 0.67
1.92 × 1.00
2.17 × 1.17
2.00 × 1.25
2.17 × 0.92
2.33 × 0.92
2.25 × 1.33
2.42 × 0.83
2.17 × 1.00
2.00 × 1.00
2.17 × 1.00
2.25 × 1.08
2.33 × 1.00
2.17 × 1.33
2.08 × 1.17
2.17 × 1.08
2.00 × 1.17
2.17 × 1.17
2.08 × 1.08
2.08 × 1.00
1.92 × 1.25
1.83 × 1.00
2.08 × 0.83
1.92 × 0.92
2.00 × 0.92

CELL 'C'
COVER THICKNESS IN FEET

LEGEND

2.25 Thickness of Soil Cover
x
1.00 Thickness of Sand Cover

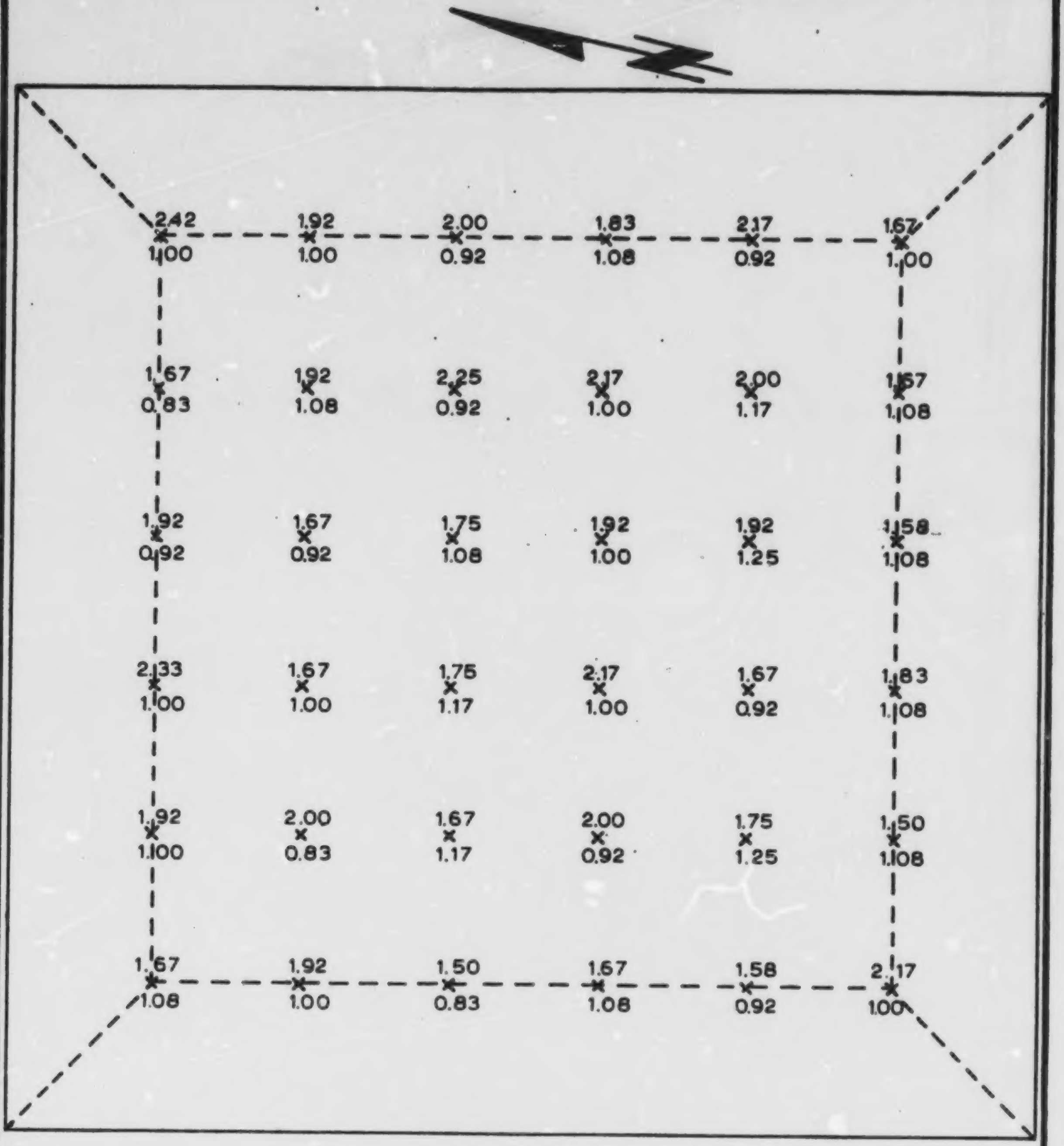
SCALE: 1 inch = 10 feet

T! 1(8-71)

PLATE B-6

By GNM Date 1-72 Checked By RL Location

Project Number 102-1.3 Client Sonoma County



2.42 1.00	1.92 1.00	2.00 0.92	1.83 1.08	2.17 0.92	1.67 1.00
1.67 0.83	1.92 1.08	2.25 0.92	2.17 1.00	2.00 1.17	1.67 1.08
1.92 0.92	1.67 0.92	1.75 1.08	1.92 1.00	1.92 1.25	1.58 1.08
2.33 1.00	1.67 1.00	1.75 1.17	2.17 1.00	1.67 0.92	1.83 1.08
1.92 1.00	2.00 0.83	1.67 1.17	2.00 0.92	1.75 1.25	1.50 1.08
1.67 1.08	1.92 1.00	1.50 0.83	1.67 1.08	1.58 0.92	2.17 1.00

CELL 'D'
COVER THICKNESS IN FEET

LEGEND

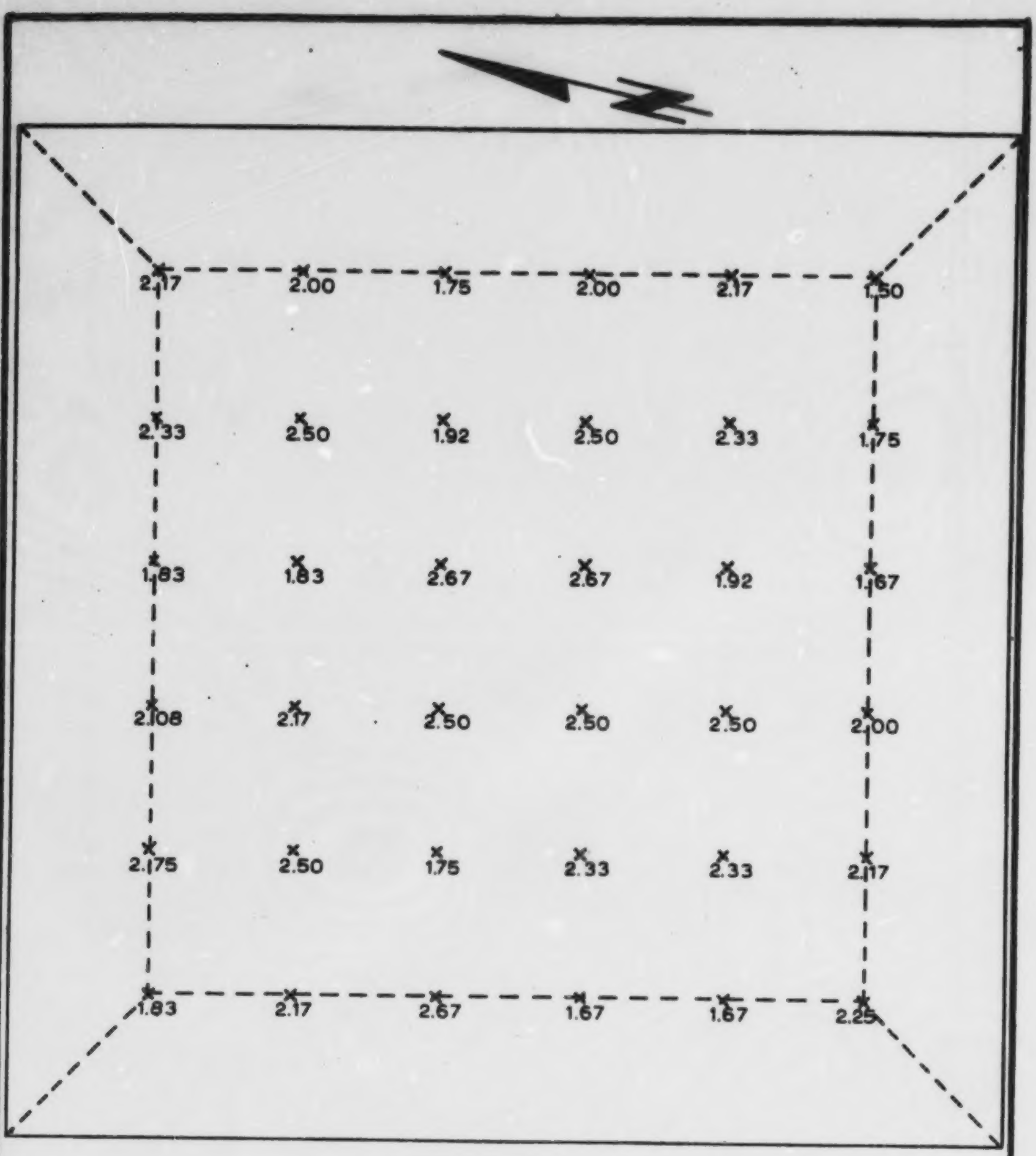
2.42	Thickness of Soil Cover
×	
1.00	Thickness of Pea Gravel Cover

SCALE: 1 inch = 10 feet

TI 1(8-71)

By GNM Date 1-72 Checked By RL Location

Project Number 102-1.3 Client Sonoma County


2.17
2.00
1.75
2.00
2.17
1.50
2.33
2.50
1.92
2.50
2.33
1.75
1.83
1.83
2.67
2.67
1.92
1.67
2.08
2.17
2.50
2.50
2.50
2.00
2.75
2.50
1.75
2.33
2.33
2.17
1.83
2.17
2.67
1.67
1.67
2.25

CELL 'E'
COVER THICKNESS IN FEET

SCALE: 1 inch = 10 feet

APPENDIX C

CLAY BARRIER CONSTRUCTION DATA

TABLE A

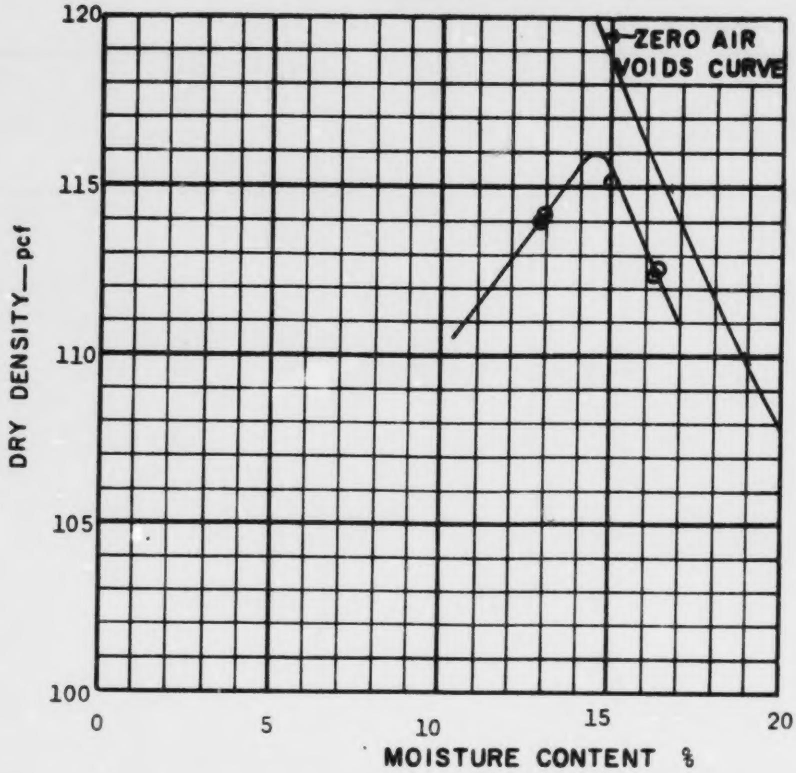
SUMMARY OF FIELD DENSITY TEST RESULTS

TEST NO.	DATE OF TEST 1971	APPROX. DEPTH OF FILL (feet)	LOCATION	APPROX. ELEVATION ((feet))	FIELD		MAXIMUM LAB DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	REMARKS
					DRY DENSITY (pcf))	WATER CONTENT (%)			
1	8/10	4.5	Barrier Core	190.5	118.7	16.4	116.0	103	
2	8/10	3.5	Barrier Core	189.5	114.0	15.8	116.0	99	Re-worked & Accepted
3	8/10	2.0	Barrier Core	187.0	113.2	17.4	116.0	98	" "
4	8/10	6.0	Barrier Core	192.0	113.7	15.1	116.0	99	" "
5	8/10	7.0	Barrier Core	193.0	111.5	16.4	116.0	97	" "
6	8/11	7.5	Barrier Core	193.5	114.2	15.5	116.0	99	" "
7	8/11	8.5	Barrier Core	194.0	117.2	15.6	116.0	101	
8	8/11	9.0	Barrier Core	194.0	117.7	16.4	116.0	102	
9	8/11	10.0	Barrier Core	195.0	122.2	15.3	116.0	105	
10	8/11	10.0	Barrier Core	195.0	119.5	15.5	116.0	103	
11	8/11	9.0	Barrier Core	194.0	120.0	15.0	116.0	104	Sand Cone Density Test Method
12	8/11	10.0	Barrier Core	195.0	118.0	15.6	116.0	102	
13	8/16	11.0	Barrier Core	196.0	119.7	15.7	116.0	103	
14	8/16	12.0	Barrier Core	197.0	117.0	15.4	116.0	101	
15	8/17	13.0	Barrier Core	198.0	119.2	15.7	116.0	103	
16	8/17	14.0	Barrier Core	199.0	117.2	16.4	116.0	101	
17	8/17	15.0	Barrier Core	200.00	121.2	15.4	116.0	105	
18	8/18	16.5	Barrier Core	201.5	118.0	16.2	116.0	102	
19	8/18	17.5	Barrier Core	202.5	113.7	17.4	116.0	98	
20	8/18	18.5	Barrier Core	203.5	116.2	19.3	116.0	100	
21	8/18	19.5	Barrier Core	204.5	122.5	15.9	116.0	105	

NOTE: All field density determination by nuclear method except as noted.

PROJECT 102-1.3

COMPACTION TEST



SAMPLE NO.
Composite

SAMPLE DEPTH
From Stockpile

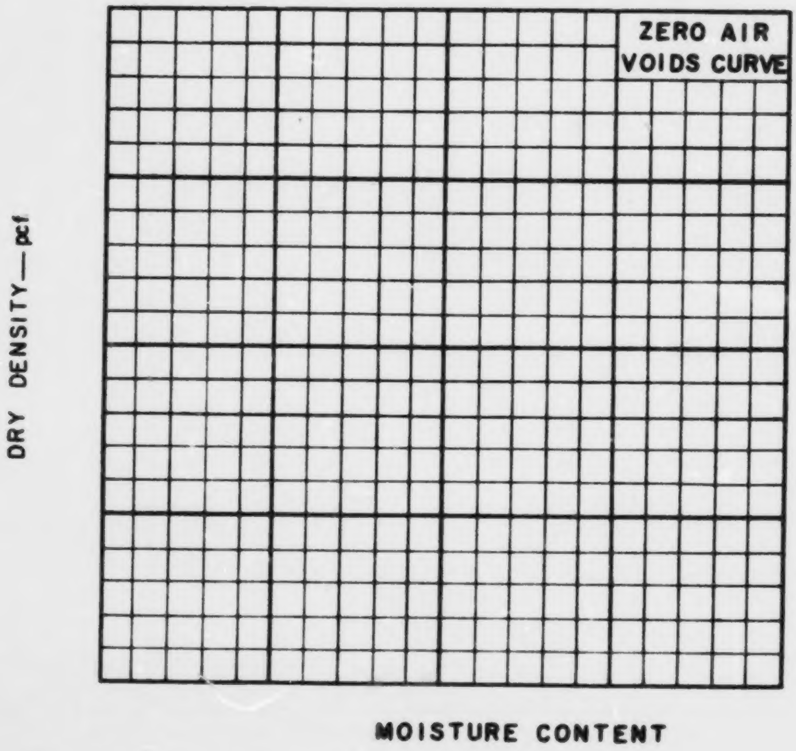
SAMPLE DESCRIPTION
Brown, Sandy
CLAY

SPECIFIC GRAVITY
2.65 (est.)

TEST DESIGNATION
ASTM D698-70

MAXIMUM DRY DENSITY (pcf)
116.0

OPTIMUM MOISTURE CONTENT, %
14.5



SAMPLE NO.

SAMPLE DEPTH

SAMPLE DESCRIPTION

SPECIFIC GRAVITY

TEST DESIGNATION

MAXIMUM DRY DENSITY (pcf)

OPTIMUM MOISTURE CONTENT, %

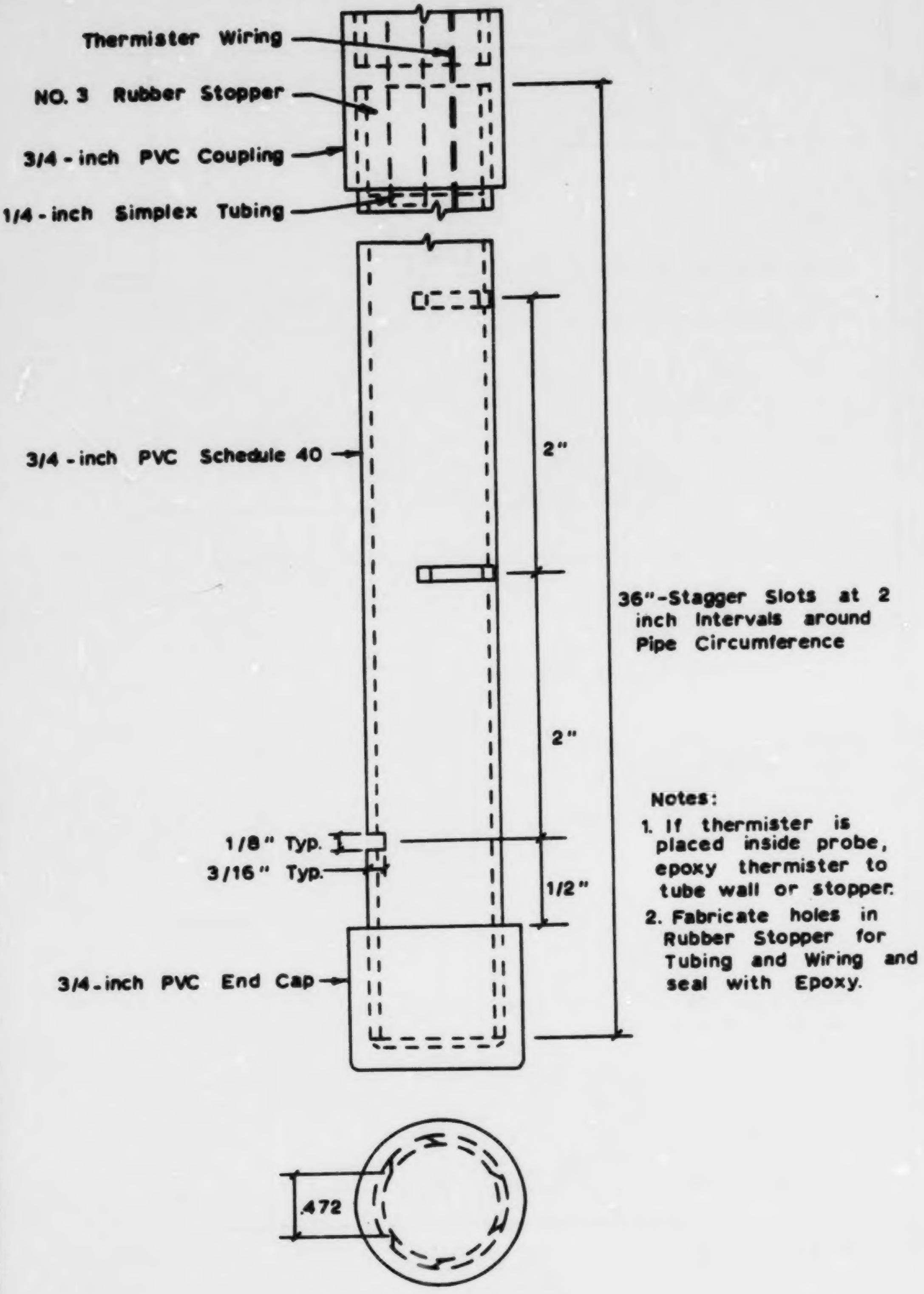
PROJECT NO. 102-1.3

APPENDIX D

INSTRUMENTATION DETAIL DRAWINGS

By GNM Date 12-71 Checked By RL Location Sonoma County, California

Project Number 102-1.3 Client Sonoma County


Thermister Wiring
NO. 3 Rubber Stopper
3/4-inch PVC Coupling
1/4-inch Simplex Tubing
3/4-inch PVC Schedule 40
2"
2"
36"-Stagger Slots at 2 inch Intervals around Pipe Circumference
1/8" Typ.
3/16" Typ.
1/2"
3/4-inch PVC End Cap
.472

Notes:

1. If thermister is placed inside probe, epoxy thermister to tube wall or stopper.
2. Fabricate holes in Rubber Stopper for Tubing and Wiring and seal with Epoxy.

GAS PROBE

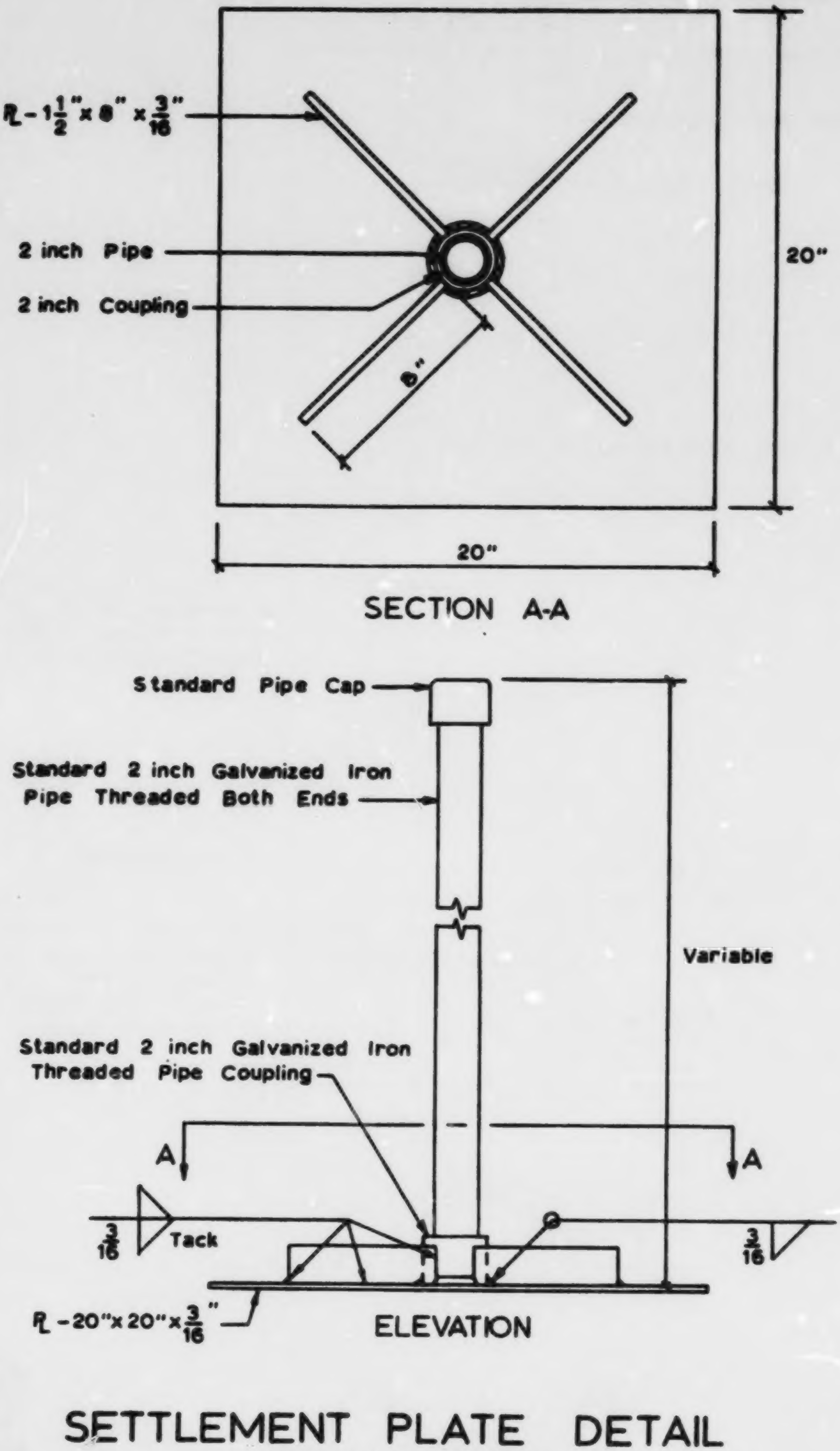
Full Scale

TI 1(8-71)

PLATE D-1

By GNM Date 1-72 Checked By RL Location Sonoma County, California

Project Number 102-1.3 Client Sonoma County

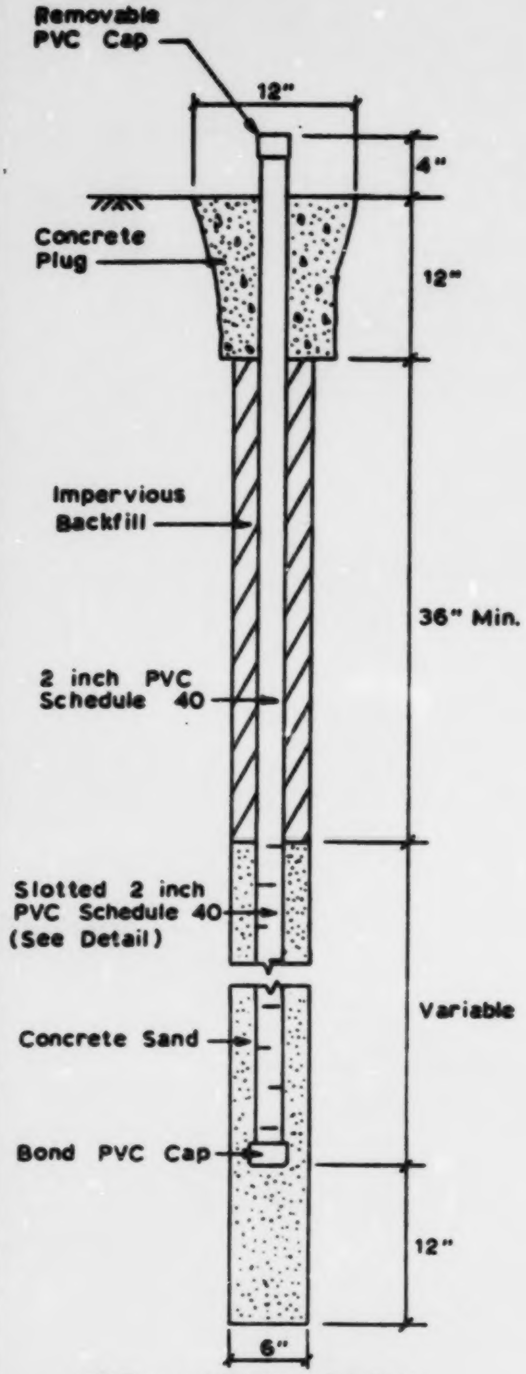


PL - 1½" x 8" x 3/16"
2 inch Pipe
2 inch Coupling
8"
20"
20"
SECTION A-A
Standard Pipe Cap
Standard 2 inch Galvanized Iron Pipe Threaded Both Ends
Variable
Standard 2 inch Galvanized Iron Threaded Pipe Coupling
A
A
3/16
Tack
3/16
PL - 20" x 20" x 3/16"
ELEVATION

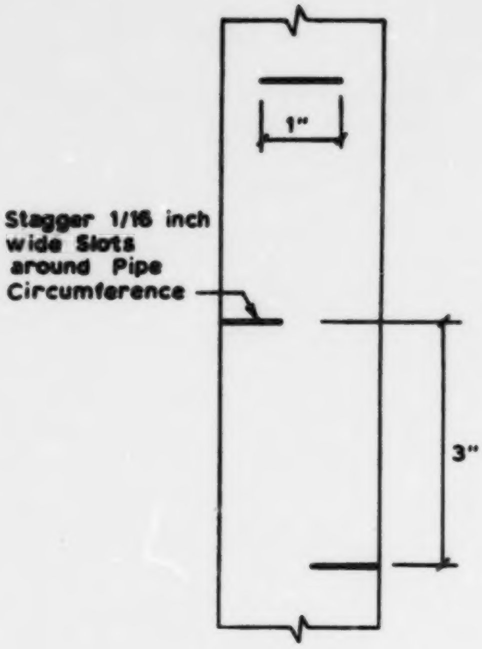
SETTLEMENT PLATE DETAIL

Scale: 1 inch = 6 inches

TI 1(8-71)


Removable PVC Cap
12"
4"
Concrete Plug
12"
Impervious Backfill
36" Min.
2 inch PVC Schedule 40
Slotted 2 inch PVC Schedule 40 (See Detail)
Variable
Concrete Sand
Bond PVC Cap
12"
6"

INSTALLATION DETAIL
Scale: 1 inch = 1 foot


1"
Stagger 1/16 inch wide Slots around Pipe Circumference
3"

SLOTTING DETAIL
Scale: 1 inch = 2 inches

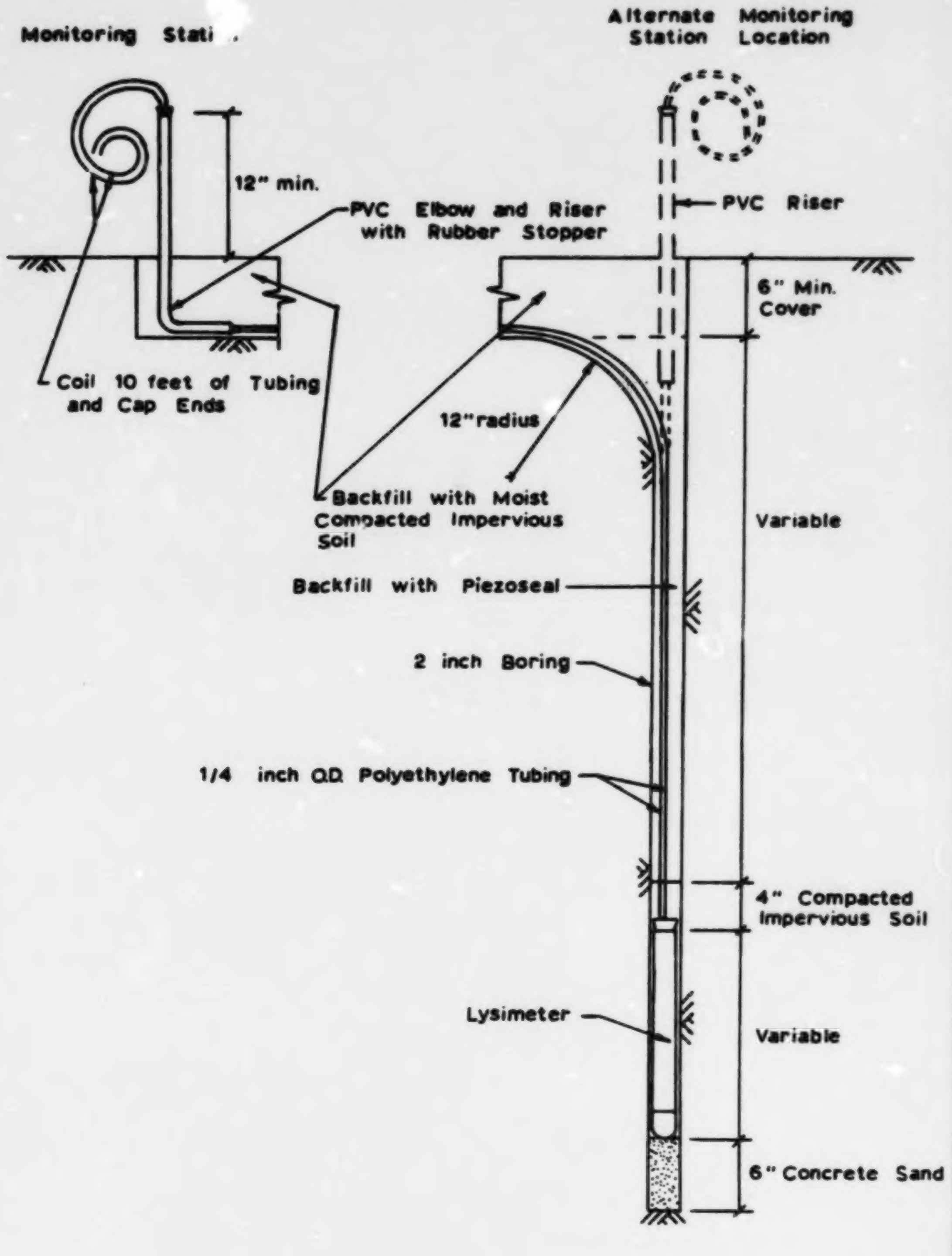
OBSERVATION WELL DETAIL

By GNM Date 12-71 Checked By RL Location Sonoma County, California
Project Number 102-1.3 Client Sonoma County

TI 1(8-71)

By GNM Date 12-71 Checked By RL Location Sonoma County, California

Project Number 102-1.3 Client Sonoma County


Monitoring Stati .
Alternate Monitoring Station Location
12" min.
PVC Elbow and Riser with Rubber Stopper
PVC Riser
6" Min. Cover
Coil 10 feet of Tubing and Cap Ends
12"radius
Backfill with Moist Compacted Impervious Soil
Variable
Backfill with Piezoseal
2 inch Boring
1/4 inch O.D. Polyethylene Tubing
4" Compacted Impervious Soil
Lysimeter
Variable
6" Concrete Sand

LYSIMETER SAMPLING SYSTEM

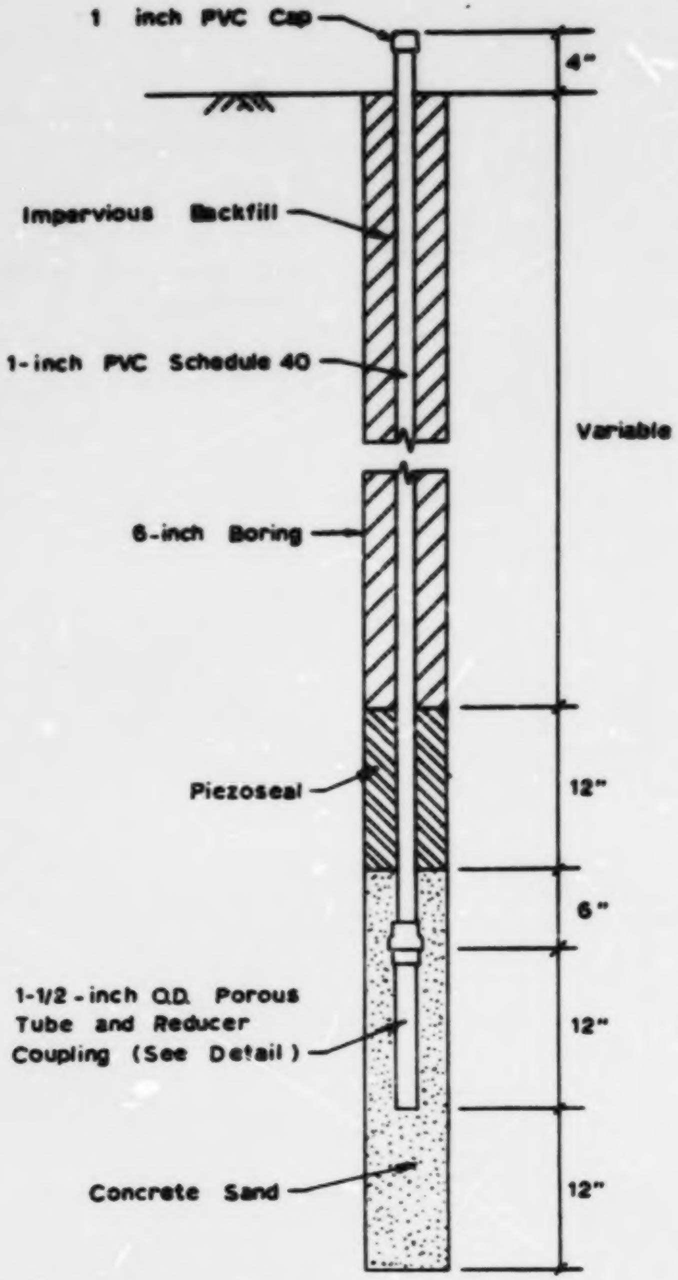
Scale: 1 inch = 1 foot

TI 1(8-71)

PLATE D-4

By GNM Date 12-71 Checked By RL

Project Number 102-1.3 Client Sonoma County Location Sonoma County, California


1 inch PVC Cap
4"
Impervious Backfill
1-inch PVC Schedule 40
Variable
6-inch Boring
Piezoseal
12"
6"
1-1/2-inch O.D. Porous Tube and Reducer Coupling (See Detail)
12"
Concrete Sand
12"

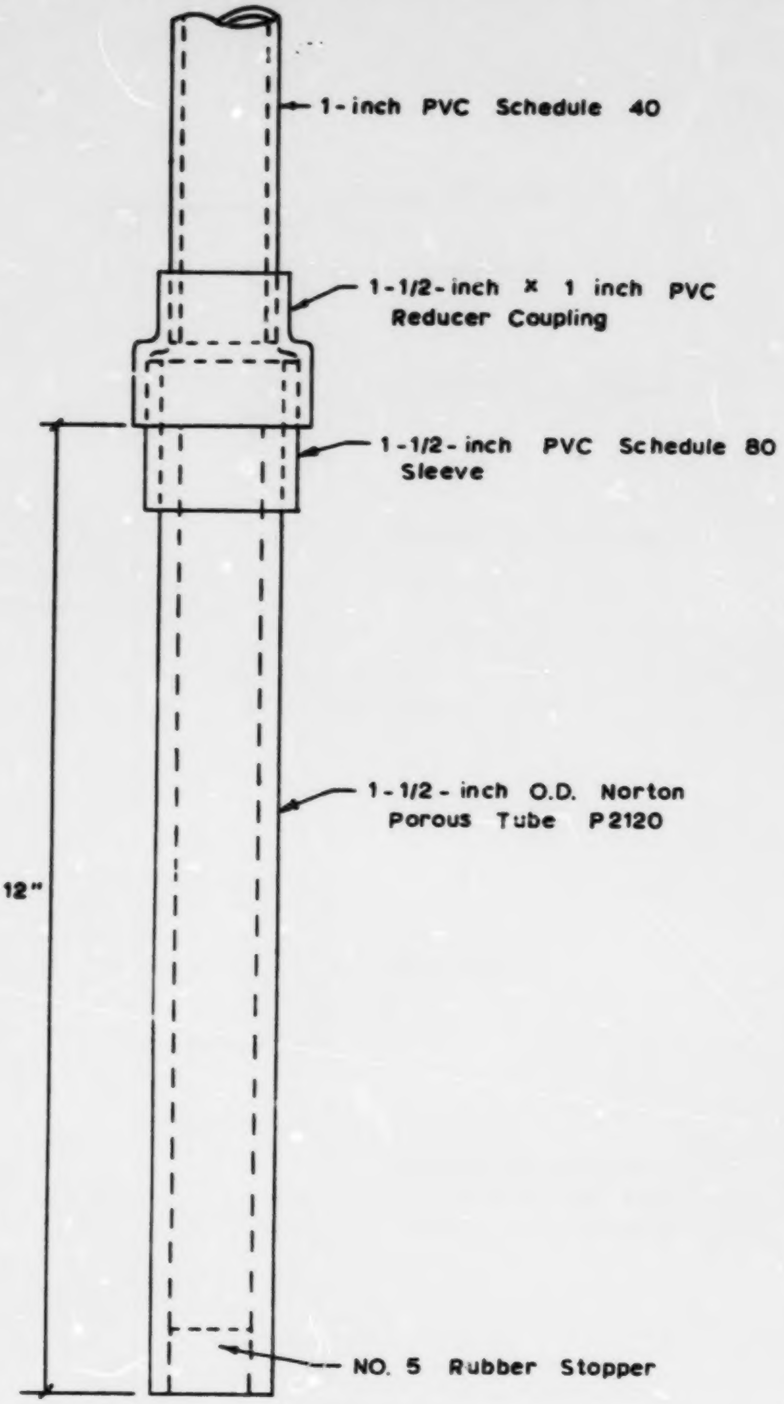
PIEZOMETER INSTALLATION DETAIL

Scale : 1 inch = 1 foot

TI 1(8-71)

PLATE D-5

By GNM Date 12-71 Checked By RL Location Sonoma County, California
Project Number 102-1-3 Client Sonoma County


1-inch PVC Schedule 40
1-1/2-inch × 1 inch PVC Reducer Coupling
1-1/2-inch PVC Schedule 80 Sleeve
1-1/2-inch O.D. Norton Porous Tube P2120
12"
NO. 5 Rubber Stopper

PIEZOMETER TIP DETAIL

Scale : 1 inch = 2 inches

TI 1(8-71)

PLATE D-6

APPENDIX E

REFUSE COMPOSITIONAL DATA

RANDOM SAMPLE ASSIGNMENT

CELL NO. A

Cumulative Weight Tons	Sample No.
21	A-21
55	A-55
92	A-92
160	A-160
168	A-168
180	A-180
189	A-189
224	A-224
238	A-238
255	A-255
359	A-359
457	A-457
480	A-480

CELL NO. B

Cumulative Weight Tons	Sample No.
11	B-11
14	B-14
78	B-78
125	B-125
178	B-178
186	B-186
187	B-187
255	B-255
265	B-265
336	B-336
365	B-365
370	B-370
439	B-439
495	B-495

CELL NO. C

Cumulative Weight Tons	Sample No.
56	C-56
118	C-118
142	C-142
159	C-159
176	C-176
178	C-178
254	C-254
261	C-261
262	C-262
394	C-394
420	C-420
472	C-472
496	C-496
499	C-499

CELL NO. D

Cumulative Weight Tons	Sample No.
10	D-10
55	D-55
63	D-63
145	D-145
168	D-168
211	D-211
252	D-252
358	D-358
359	D-359
420	D-420
436	D-436
438	D-438
456	D-456
493	D-493

CELL NO. E

Cumulative Weight Tons	Sample No.
80	E-80
86	E-86
87	E-87
105	E-105
157	E-157
250	E-250
259	E-259
276	E-276
295	E-295
338	E-338
362	E-362
407	E-407
432	E-432
495	E-495

NOTE: Random sample numbers (500 unit sample) obtained from:
Handbook of Tables for Mathematics, 4th Ed.
Chemical Rubber Co. 1970
18901 Cranwood Pkwy., Cleveland, Ohio 44128

PLATE E-1

REFUSE COMPOSITION DATA
CELL A

SAMPLE #		food waste	garden waste	paper	plastic rubber, etc.	textile	wood	metals	glass, ceramic	ash, rock, dirt	fines	TOTAL
A21	%	7.7	3.5	22.9	5.1	1.0	0.9	6.8	11.7	16.0	24.4	100%
	wt.	23.6	10.6	70.3	15.8	3.0	2.9	21.0	36.0	49.2	75.0	307.4
A55	%	9.4	2.2	22.2	3.9	1.4	0.9	7.4	8.2	27.3	17.1	
	wt.	33.8	7.8	79.7	13.9	5.0	3.0	26.6	29.5	97.9	61.1	358.3
A92	%	10.7	5.1	41.8	6.1	0.5	0.9	8.8	8.4	2.1	15.6	
	wt.	38.9	18.7	152.1	22.3	1.7	3.4	31.9	30.6	7.8	56.8	364.2
A160	%	6.2	12.2	26.9	3.0	0.5	0.7	4.5	8.5	6.0	31.5	
	wt.	29.3	57.6	126.5	13.9	2.2	3.3	21.3	39.9	28.2	148.3	470.5
A168	%	8.8	33.4	18.6	2.9	0.8	0.1	8.2	5.1	4.5	17.6	
	wt.	50.2	191.4	106.7	16.5	4.7	0.5	47.0	29.0	26.0	101.0	573.1
A180	%	7.1	32.8	32.5	5.4	1.5	0.5	3.8	6.7	0.3	9.4	
	wt.	21.5	99.5	98.5	16.5	4.5	1.5	11.5	20.2	1.0	28.5	303.2
A189	%	15.4	0.1	41.9	4.5	1.8	7.2	10.2	9.4	0.6	8.9	
	wt.	50.1	0.1	136.2	14.7	5.9	23.5	33.0	30.6	1.8	29.0	324.9
A224	%	7.6	2.2	49.3	4.4	1.1	0.3	10.2	8.7	3.1	13.1	
	wt.	21.0	6.0	135.5	12.0	3.0	0.8	28.0	24.0	8.5	36.0	274.8
A238	%	10.5	6.8	32.0	4.0	2.4	0.6	6.5	12.3	2.9	22.0	
	wt.	42.0	27.0	128.0	16.0	9.5	2.5	26.0	49.5	11.5	88.0	400.0
A255	%	8.7	5.8	49.1	3.0	0.9	0.2	7.9	9.9	1.5	13.0	
	wt.	27.6	18.5	156.3	9.6	3.0	0.6	25.1	31.5	4.6	41.5	318.3
A359	%	12.1	11.4	38.1	4.5	1.1	1.7	14.9	10.3	0.5	5.4	
	wt.	39.4	37.1	124.1	14.5	3.5	5.5	48.6	33.6	1.6	17.5	325.4
A457	%	5.5	21.3	47.5	3.6	0.8	1.6	6.7	6.2	4.1	2.7	
	wt.	17.5	67.5	150.9	11.3	2.6	5.1	21.2	19.5	13.0	8.6	317.2
A480	%	4.6	3.3	38.3	4.1	0.9	1.1	7.6	13.3	6.9	19.9	
	wt.	16.4	11.6	135.9	14.6	3.0	3.8	27.0	46.9	24.3	70.5	354.0
	%											
	wt.											

* % is %of wet weight.

PLATE E-2

REFUSE COMPOSITION DATA
CELL B

SAMPLE #		food waste	garden waste	paper	plastic rubber, etc.	textile	wood	metals	glass, ceramic	ash, rock, dirt	fines	TOTAL
B11	%	9.3	6.4	51.5	3.7	1.0	0.1	7.6	11.0	1.4	8.0	100%
	wt.	37.5	26.0	208.5	15.0	4.0	0.5	30.5	44.5	5.5	32.2	404.2
B14	%	12.4	15.4	40.6	5.1	1.1	1.5	12.0	7.3	2.5	2.1	
	wt.	55.3	68.5	180.5	22.5	5.0	6.5	53.5	32.5	11.0	9.5	444.8
B78	%	2.1	30.7	37.3	5.6	0.7	1.1	10.2	5.8	1.2	5.4	
	wt.	6.5	93.3	113.5	17.0	2.0	3.3	31.0	17.5	3.5	16.5	304.1
B125	%	7.6	34.5	36.9	2.7	0.5	2.7	7.0	7.6	0.0	0.5	
	wt.	23.5	107.0	114.5	8.4	1.5	8.5	21.7	23.5	0.0	1.5	310.1
B178	%	6.7	12.0	47.6	8.6	0.7	0.1	9.0	4.8	3.4	7.1	
	wt.	21.1	38.1	150.5	27.1	2.1	0.3	28.6	15.2	10.6	22.6	316.2
B186	%	10.8	10.7	42.1	5.6	0.9	1.7	11.1	8.7	0.6	7.7	
	wt.	44.5	44.0	173.4	23.2	3.8	7.1	45.5	36.0	2.5	31.5	411.5
B187	%	19.6	0.7	38.7	3.2	1.4	0.4	12.3	14.1	0.3	9.3	
	wt.	64.5	2.4	127.4	10.6	4.5	1.4	40.5	46.6	0.9	30.8	329.6
B255	%	19.9	0.7	48.4	3.8	1.3	1.9	10.5	9.3	0.9	3.3	
	wt.	75.5	2.5	183.1	14.5	4.9	7.4	39.6	35.1	3.5	12.5	378.6
B265	%	6.6	9.3	41.6	5.4	2.8	0.6	10.3	13.7	1.0	8.7	
	wt.	24.6	34.8	156.2	20.3	10.6	2.4	38.8	51.3	3.8	32.8	375.6
B336	%	7.8	23.0	43.6	3.8	3.1	0.2	8.5	8.3	0.0	1.7	
	wt.	28.0	82.2	156.1	13.6	11.2	0.8	30.4	29.6	0.1	6.1	358.1
B365	%	9.9	2.7	44.3	7.4	2.8	0.9	11.1	17.8	0.2	2.9	
	wt.	31.4	8.4	140.2	23.2	8.7	2.7	35.3	56.1	0.5	9.2	315.7
B370	%	13.2	9.7	37.4	5.9	0.8	1.3	9.5	16.5	0.0	5.7	
	wt.	43.6	32.2	124.0	19.6	2.5	4.3	31.6	54.5	0.0	19.0	331.3
B439	%	2.9	0.0	63.7	3.3	0.5	3.2	7.2	4.2	2.5	12.5	
	wt.	10.0	0.0	220.2	11.5	1.7	11.0	25.0	14.4	8.5	43.0	345.3
B495	%	16.7	0.0	49.6	8.5	2.1	0.2	11.8	8.9	0.7	1.5	
	wt.	48.1	0.0	143.2	24.5	6.0	0.7	34.1	25.6	2.0	4.4	288.6

* % is %of wet weight.

REFUSE COMPOSITION DATA
CELL C

SAMPLE #		food waste	garden waste	paper	plastic rubber, etc.	textile	wood	metals	glass, ceramic	ash, rock, dirt	fines	TOTAL
C56	%	4.4	8.2	32.0	3.2	0.4	0.2	4.6	2.8	32.9	11.3	100%
	wt.	29.1	54.2	211.5	21.1	2.5	1.0	30.0	18.6	216.0	74.5	658.5
C118	%	11.4	3.8	37.4	3.7	4.7	0.2	8.7	11.3	1.3	17.5	
	wt.	43.0	14.5	141.2	13.8	17.7	0.6	33.0	49.7	4.9	66.1	377.5
C142	%	20.9	0.3	42.7	3.0	1.1	0.1	8.2	16.7	0.1	6.3	
	wt.	38.6	0.6	79.0	6.6	2.0	0.1	15.1	31.0	0.1	11.7	184.8
C159	%	11.9	25.5	28.9	4.0	2.7	2.0	4.5	12.1	2.8	5.6	
	wt.	40.5	86.6	98.0	13.6	9.1	6.9	15.3	40.7	9.5	19.0	339.2
C176	%	13.7	0.0	49.1	5.3	0.4	0.1	10.0	16.5	0.1	4.8	
	wt.	37.0	0.1	133.2	14.3	1.0	0.2	27.0	44.5	0.2	13.0	270.5
C178	%	10.2	0.7	50.2	7.3	7.7	0.5	9.6	9.8	0.0	4.0	
	wt.	32.0	2.3	157.3	22.9	24.0	1.6	30.1	30.7	0.0	12.6	313.5
C254	%	15.3	0.9	44.7	8.1	2.5	0.1	10.6	13.6	0.5	3.7	
	wt.	45.6	2.8	133.1	24.0	7.5	0.3	31.6	40.5	1.5	11.1	298.0
C261	%	18.8	2.8	30.2	5.9	5.4	2.1	11.1	14.8	2.5	6.4	
	wt.	82.5	12.0	132.3	25.7	23.8	9.1	48.5	64.8	11.0	28.2	437.9
C262	%	12.0	1.7	40.6	5.1	2.7	0.0	12.5	16.0	1.6	7.8	
	wt.	42.6	6.1	143.7	18.1	9.5	0.1	44.0	56.8	5.8	27.5	354.2
C394	%	13.7	6.7	46.6	4.3	2.1	0.0	8.4	8.6	2.1	7.5	
	wt.	58.8	28.9	201.1	18.5	9.2	0.0	36.4	36.9	9.0	32.4	431.2
C420	%	13.4	11.2	39.0	6.4	2.5	1.0	9.0	10.6	2.7	4.7	
	wt.	38.9	32.8	113.8	18.6	7.4	3.0	26.4	30.8	6.4	13.8	291.9
C472	%	10.2	13.6	48.0	5.2	1.1	1.0	10.6	8.7	0.2	1.4	
	wt.	28.0	37.5	132.0	14.3	3.0	2.8	29.0	24.0	0.5	3.9	275.0
C496	%	10.0	3.8	55.5	4.1	1.0	0.3	8.0	9.3	0.6	7.4	
	wt.	40.0	15.1	221.8	16.5	4.0	1.0	32.0	37.2	2.2	29.5	399.3
C499	%	13.8	1.5	48.8	5.4	0.9	0.4	7.0	10.4	3.5	8.3	
	wt.	35.6	3.9	126.0	14.0	2.3	0.9	18.1	26.9	9.0	21.5	258.2

* % is %of wet weight.

PLATE E-4

REFUSE COMPOSITION DATA
CELL D

SAMPLE #		food waste	garden waste	paper	plastic rubber, etc.	textile	wood	metals	glass, ceramic	ash, rock, dirt	fines	TOTAL
D10	%	8.4	7.8	58.5	4.2	0.8	1.1	7.7	10.2	0.4	0.9	100%
	wt.	25.1	23.4	174.3	12.4	2.5	3.2	23.1	30.4	1.3	2.6	298.3
D55	%	16.2	0.7	46.0	4.9	1.8	0.4	11.3	14.4	0.0	4.8	
	wt.	50.2	0.5	142.0	15.1	5.4	1.1	35.0	44.7	0.0	15.0	309.0
D63	%	12.7	11.7	37.5	3.8	1.4	0.6	10.1	11.9	1.1	9.2	
	wt.	54.7	49.9	160.6	16.4	5.8	2.5	43.3	51.1	4.8	39.5	428.6
D145	%	15.2	0.7	39.9	4.5	1.8	2.4	9.0	15.9	1.1	9.5	
	wt.	46.6	2.0	121.9	13.8	5.5	7.4	27.5	48.7	3.5	28.9	305.8
D168	%	11.2	5.8	46.3	7.4	1.3	1.0	8.7	11.6	2.1	4.6	
	wt.	40.6	21.0	167.9	26.8	4.7	3.6	31.6	42.1	7.6	16.7	362.6
D211	%	11.7	7.9	43.9	4.0	0.3	0.6	11.5	10.3	0.2	9.6	
	wt.	36.3	24.5	136.8	12.5	1.0	1.8	35.7	32.1	0.5	29.9	311.1
D252	%	10.3	14.3	45.8	3.6	0.7	0.3	8.2	10.8	1.1	4.9	
	wt.	30.7	42.6	136.2	10.8	2.0	0.8	24.5	32.3	3.2	14.6	297.7
D358 D359	%	6.1	3.7	44.9	6.0	1.3	1.4	8.2	13.5	2.7	12.2	
	wt.	43.0	25.8	315.8	42.0	9.4	9.8	58.0	95.0	19.3	86.0	704.1
D420	%	9.0	15.0	48.7	3.5	0.3	0.3	7.9	10.9	0.0	4.4	
	wt.	29.6	49.6	161.1	11.5	1.1	1.1	26.0	36.1	0.0	14.7	330.8
D436	%	7.7	0.0	46.7	5.4	4.2	1.3	10.6	13.0	0.0	11.1	
	wt.	24.6	0.0	148.9	17.1	13.2	4.1	33.6	41.4	0.0	35.4	318.3
D438	%	6.1	28.3	33.4	3.1	0.9	1.0	7.3	13.6	0.0	6.3	
	wt.	16.0	74.1	87.7	8.1	2.4	2.6	19.2	35.6	0.0	16.4	262.1
D456	%	8.9	2.3	54.7	6.9	2.5	1.0	9.6	10.1	0.7	3.3	
	wt.	36.7	9.5	226.7	28.4	10.4	4.3	40.0	41.8	3.1	13.7	414.6
D493	%	6.4	2.9	42.4	3.3	2.7	5.0	15.3	13.7	1.0	7.3	
	wt.	18.6	8.5	123.2	9.2	7.8	14.6	44.3	39.6	3.0	21.2	290.5
	%											
	wt.											

* % is % of wet weight.

REFUSE COMPOSITION DATA
CELL E

SAMPLE #		food waste	garden waste	paper	plastic rubber, etc.	textile	wood	metals	glass, ceramic	ash, rock, dirt	fines	TOTAL
E80	%	12.9	9.1	39.3	4.4	1.3	0.6	8.3	16.7	1.4	6.0	100%
	wt.	44.0	31.2	134.5	15.0	4.4	1.9	28.5	57.0	4.9	20.5	341.9
E86	%	10.4	4.5	39.7	3.4	1.0	0.0	6.4	12.2	2.6	19.8	
	wt.	40.9	17.5	155.3	13.4	3.9	0.1	25.0	48.0	10.1	77.5	391.7
E87	%	10.9	8.7	46.0	3.6	1.0	0.5	10.0	11.9	0.6	6.8	
	wt.	35.2	28.0	148.4	11.5	3.4	1.5	32.5	38.5	2.0	21.9	322.9
E105	%	5.0	46.6	16.5	1.8	0.2	0.0	3.1	8.0	6.4	12.4	
	wt.	21.9	203.0	71.6	8.0	1.0	0.1	13.5	35.0	28.0	54.1	436.2
E157	%	14.5	4.3	37.8	4.0	1.8	1.0	10.4	12.8	0.6	12.8	
	wt.	57.5	17.1	149.3	15.8	7.0	4.0	41.1	50.5	2.5	50.8	395.6
E250	%	11.8	3.4	39.8	4.4	1.3	0.2	7.9	9.7	13.0	8.5	
	wt.	39.4	11.1	132.7	14.5	4.4	0.5	26.2	32.1	43.2	28.2	331.8
E259	%	40.6	1.8	20.8	4.9	4.2	0.6	8.0	9.5	4.9	4.7	
	wt.	141.2	6.1	72.4	17.1	14.6	2.0	28.0	33.1	17.0	16.2	347.7
E276	%	10.5	26.5	33.4	3.7	2.4	0.4	11.8	10.7	0.6	0.0	
	wt.	35.6	90.2	113.5	12.5	8.2	1.2	40.0	36.4	2.2	0.0	339.8
E295	%	2.7	53.4	27.8	5.4	1.3	1.0	5.4	2.8	0.2	0.0	
	wt.	7.0	140.1	72.8	14.0	3.5	2.5	14.1	7.4	0.5	0.0	261.9
E338	%	6.8	42.3	28.2	3.4	1.6	0.3	7.4	9.2	0.8	0.0	
	wt.	23.5	147.0	98.1	11.8	5.6	1.0	25.7	32.0	2.9	0.0	347.6
E362	%	8.2	6.2	38.7	5.7	3.5	0.0	14.7	17.1	0.5	5.4	
	wt.	24.0	18.0	112.5	16.6	10.2	0.1	42.7	49.7	1.5	15.8	291.1
E407	%	12.7	1.9	40.7	4.4	1.1	0.0	11.2	18.3	0.6	9.1	
	wt.	39.7	6.0	127.4	13.8	3.5	0.1	35.1	57.3	2.0	28.4	313.3
E432	%	13.2	11.0	39.3	5.2	4.8	0.6	9.0	12.8	0.9	3.2	
	wt.	44.6	37.1	133.1	17.5	16.3	2.0	30.5	43.1	3.0	10.7	337.9
E495	%	8.2	19.3	45.5	1.9	0.8	0.0	6.6	8.8	6.1	2.8	
	wt.	32.7	77.2	181.2	7.6	3.1	0.1	26.4	33.7	24.5	11.1	397.6

* % is %of wet weight.

PLATE E-6

REFUSE MOISTURE CONTENT DATA - CELL A

sample no.	total wet wt.	total dry wt.	% moist
21	12.25	7.69	59.3
55	13.70	9.80	39.8
92	11.55	7.38	56.5
160	25.52	17.59	45.1
168	8.67	6.55	32.4
180	10.66	8.15	30.8
224	12.41	10.14	22.4
238			
255			
359			
457			
480			

* % are % of dry weight.

		food waste	garden waste	paper	plastic rubber	textile	wood	metal	glass ceramic	ash, rock	fines
composit sample 1	total wet weight #										
	total dry weight #										
	%moisture										

Composit of samples ,

NOTE - Composit Drying Samples were not taken for Cell A

composit sample 2	total wet weight #										
	total dry weight #										
	%moisture										

Composit of samples,

composit sample 3	total wet weight #										
	total dry weight #										
	%moisture										

Composit of samples,

REFUSE MOISTURE CONTENT DATA - CELL B

sample no.	total wet wt.	total dry wt.	% moist
11	13.45	9.89	36.0
14	7.61	6.14	23.9
78	7.41	5.19	42.8
125	4.94	4.04	22.3
178	6.59	5.11	29.0
186	5.93	3.94	50.1
187	6.27	3.88	61.6
255	6.60	4.29	53.9
265	5.39	4.19	28.6
336	4.81	2.93	64.2
365	5.90	4.87	21.2
370	7.00	3.98	75.9
439	5.64	5.03	12.1
495	10.8	7.96	36.7

* % are % of dry weight.

		food waste	garden waste	paper	plastic rubber	textile	wood	metal	glass ceramic	ash, rock	fines
composit sample 1	total wet weight #	10.02	7.10	7.34	6.80	6.60	7.04	9.33	8.36	5.89	8.19
	total dry weight #	4.04	4.42	5.82	5.90	4.98	6.56	8.95	8.33	5.79	5.69
	%moisture	148.0	60.3	26.1	15.3	32.5	7.3	4.3	0.5	1.7	43.9

Composit of samples , B-11, B-14,B-78, B-125

composit sample 2	total wet weight #	13.88	10.44	11.86	8.93	8.88	7.25	11.14	11.56	8.54	11.54
	total dry weight #	5.22	6.47	8.78	6.92	6.61	6.45	10.28	11.47	7.45	8.00
	%moisture	165.9	61.4	35.1	29.1	34.3	12.4	8.4	0.8	14.6	14.3

Composit of samples, B-178, B-186, B-187, B-255, B-265

composit sample 3	total wet weight #	10.92	6.84	9.98	8.53	9.48	7.67	9.86	11.73	5.03	10.87
	total dry weight #	4.58	3.79	8.00	7.22	6.49	6.40	9.28	11.62	4.38	7.14
	%moisture	138.4	80.5	24.8	18.1	46.1	19.8	6.3	1.0	14.8	52.2

Composit of samples, B-336, B=365, B-370, B-439, B-495

REFUSE MOISTURE CONTENT - CELL C

sample no.	total wet wt.	total dry wt.	% moist
56	6.63	4.63	43.2
118	8.75	5.59	56.5
142	7.63	6.44	18.5
159	5.05	3.92	28.8
176	6.46	4.94	30.8
178	11.73	5.32	120.5
254	8.31	6.78	22.6
261	6.48	5.89	10.0
262	6.28	4.69	33.9
394	11.73	8.10	44.8
420	7.90	5.31	48.8
472	5.69	4.84	17.6
496	6.20	5.23	18.6
499	4.98	3.55	40.3

		food waste	garden waste	paper	plastic rubber	textile	wood	metal	glass ceramic	ash, rock	fines
composit sample 1	total wet weight #	13.82	9.65	13.79	7.80	10.65	5.08	12.00	13.73	15.48	11.77
	total dry weight #	6.01	4.70	10.34	6.17	7.86	4.13	11.22	13.65	12.30	8.46
	%moisture	130.0	105.3	33.4	26.4	35.5	23.0	7.0	0.6	25.9	39.1

Composit of samples , C-56, C-118, C-142, C-159, C-176, C-178

composit sample 2	total wet weight #	18.60	17.25	16.46	10.36	14.42	6.35	16.34	16.80	15.48	16.54
	total dry weight #	7.88	8.98	13.34	9.15	11.91	5.72	15.38	16.65	12.30	10.65
	%moisture	136.0	92.1	23.4	13.2	21.1	11.0	6.2	0.9	25.9	55.3

Composit of samples, C-254, C-261, C-262, C-394, C-420, C-472, C-496, C-499.

composit sample 3	total wet weight #										
	total dry weight #										
	%moisture										

Composit of samples,

* % are % of dry weight.

REFUSE MOISTURE CONTENT - CELL D

sample no.	total wet wt.	total dry wt.	% moist
10	6.93	5.47	26.7
55	4.06	2.94	38.1
63	5.42	4.26	27.2
145	5.76	4.94	16.6
168	7.28	5.90	23.4
211	8.36	4.82	73.4
252	6.70	5.29	26.7
358	17.01	12.44	36.7
359	17.01	12.44	36.7
420	6.80	5.77	17.9
438	9.51	8.28	14.9
436	8.59	6.59	30.4
456	8.97	6.90	30.0
493	DATA LOST		

		food waste	garden waste	paper	plastic rubber	textile	wood	metal	glass ceramic	ash, rock	fines
composit sample 1	total wet weight #	11.12	8.28	9.24	6.71	10.45	9.20	12.42	13.28	7.36	12.22
	total dry weight #	4.79	4.35	7.36	5.73	8.22	7.19	11.76	13.18	6.37	8.22
	%moisture	132.2	90.3	25.5	17.1	27.1	27.96	5.6	0.8	15.5	48.7

Composit of samples ,D-10, D-55, D-63, D-145, D-168, D-211

composit sample 2	total wet weight #	4.97	9.16	11.73	5.58	6.73	6.99	9.44	12.18	2.96	9.55
	total dry weight #	2.71	4.04	9.41	4.97	5.64	5.85	9.01	12.14	2.50	6.38
	%moisture	83.4	126.7	24.6	12.3	19.3	19.5	4.8	0.3	18.4	49.7

Composit of samples,D-252, D-358, D-359, D-420, D-438

composit sample 3	total wet weight #	8.31	2.61	5.21	4.48	4.59	4.86	6.70	7.05	5.32	5.67
	total dry weight #	3.49	1.39	3.18	3.87	3.34	4.13	6.61	7.03	4.74	3.94
	%moisture	138.1	87.8	63.8	15.8	37.4	17.7	1.4	0.3	12.2	43.9

Composit of samples, D-436, D-456, D-493

* % are % of dry weight.

REFUSE MOISTURE CONTENT DATA - CELL E

sample no.	total wet wt.	total dry wt.	% moist
80	8.38	7.21	16.2
86	9.84	8.10	21.5
87	9.95	8.55	16.4
105	6.67	6.15	8.5
157	10.54	7.62	38.3
250	3.39	2.05	65.4
259	7.00	4.50	55.6
276	6.53	4.59	42.3
295	2.52	2.02	24.8
338	4.52	3.44	31.4
362	5.15	4.35	18.4
407	4.48	3.27	37.0
432	6.41	5.34	20.0
495	8.56	5.09	68.2

		food waste	garden waste	paper	plastic rubber	textile	wood	metal	glass ceramic	ash, rock	fines
composit sample 1	total wet weight #	11.52	10.30	11.11	8,95	8.74	4.87	10.37	13.28	9.15	13.03
	total dry weight #	4.83	5.78	7.94	7.75	7.50	4.36	10.16	13.21	8.59	9.82
	%moisture	138.5	78.2	39.9	15.5	16.5	11.7	2.1	0.5	6.5	32.7

Composit of samples , E-80, E-86, E-87, E-105, E-157

		food waste	garden waste	paper	plastic rubber	textile	wood	metal	glass ceramic	ash, rock	fines
composit sample 2	total wet weight #	15.09	14.20	14.34	9.21	13.47	5.03	12.41	14.40	11.43	8.34
	total dry weight #	7.50	7.75	11.49	7.47	10.09	4.23	12.08	14.17	10.53	5.61
	%moisture	101.2	83.2	24.8	23.3	33.5	18.9	2.7	1.6	8.6	48.7

Composit of samples, E-250, E-259, E-276, E-295, E-338, E-362, E-407

		food waste	garden waste	paper	plastic rubber	textile	wood	metal	glass ceramic	ash, rock	fines
composit sample 3	total wet weight #	7.54	4.69	4.37	4.28	INVALID	2.60	3.86	4.52	5.71	4.18
	total dry weight #	3.32	2.21	3.28	3.50		2.13	3.63	4.49	4.60	2.42
	%moisture	127.1	112.2	33.2	22.3		22.1	6.3	0.7	24.1	72.7

Composit of samples, E-432, E-495

*** % are % of dry weight.**

APPENDIX F

MONITORING SCHEDULES

SUMMARY SAMPLING SCHEDULE

Initial Frquency of Analysis for Various Parameters

	Initial Frequency	
Parameter	Leachate	Groundwater
K	*	*
Na	*	*
Ca	semi-monthly**	monthly**
Mg	semi-monthly**	monthly**
Hg	*	*
Pb	*	*
Zn	*	*
Cu	*	*
Cd	*	*
Cl	semi-monthly**	semi-monthly**
PCB	*	*
pH	semi-monthly	semi-monthly
Alkalinity	semi-monthly	semi-monthly
COD	semi-monthly	monthly**
BOD	semi-monthly	monthly**
TDS	semi-monthly	semi-monthly
TSS	semi-monthly	none
Settleable Solids	semi-monthly	none
Nitrogen		
Ammonia	semi-monthly	monthly**
Organic - N	semi-monthly	none
Nitrate - N	semi-monthly	monthly**

PLATE F-1

Parameter	Leachate	Groundwater
Total Phosphate	semi-monthly	none
DO	semi-monthly	none
Color	semi-monthly	none
Volatile Acids	monthly***	none
Fecal Coliform	semi-monthly**	monthly**
Fecal Streptococci	semi-monthly**	none

---

* Baseline data to be collected monthly at least for the first six months. The frequency of analysis will then be reevaluated on the basis of the available data.

** Frequency of analysis may change as the data are reviewed.

*** Baseline date to be collected at least the first 4 months within subsequent analysis depending on development of pH, alkalinity and BOD data.

SUMMARY SAMPLING SCHEDULE

Frequency of Gas Analysis

Commencing February 15, 1972

Cell Location	Sampling Frequency
Cell A - Bottom	Quarterly
A - Middle	Monthly
A - Top	Quarterly
Cell B - Bottom	Quarterly
B - Middle	Monthly
B - Top	Quarterly
Cell C - Bottom	Quarterly
C - Middle	Monthly
C - Top	Quartly
Cell D - Bottom	*
D - Middle	*
D - Top	Monthly
Cell E - Bottom	Quarterly
E - Middle	Monthly
E - Top	Quarterly

---

* No gas samples can be withdrawn from these probes due to fluid interference. Attempts in January 1972 to remove fluids encountered in these probes were unsuccessful. Attempts will be made periodically to withdraw samples.

SUMMARY SAMPLING SCHEDULE

Frequency of Analysis for Various Parameters
Commencing February 15, 1972

Parameter	Leachate		Groundwater
	Cells A, B & E	Cells C & D	Wells 1 thru 4 A & E Subdrain Water Supply Cell C
K	6-week intervals	monthly	quarterly
Na	6-week intervals	monthly	quarterly
Ca	6-week intervals	semi-monthly	quarterly
Mg	6-week intervals	semi-monthly	quarterly
Hg	6-week intervals	monthly	quarterly
Pb	6-week intervals	monthly	quarterly
Zn	6-week intervals	monthly	quarterly
Cu	6-week intervals	monthly	quarterly
Cl	6-week intervals	semi-monthly	quarterly
PCB	------	quarterly	semi-annually
pH	6-week intervals	semi-monthly	monthly
Alkalinity	6-week intervals	semi-monthly	quarterly
COD	6-week intervals	semi-monthly	quarterly
BOD	6-week intervals	semi-monthly	semi-annually
TDS	6-week intervals	semi-monthly	quarterly
TSS	6-week intervals	semi-monthly	quarterly
Settleable Solids	-----	quarterly	
Nitrogen			
Ammonia	6-week intervals	semi-monthly	semi-annually
Organic N	6-week intervals	semi-monthly	----
Nitrate N	6-week intervals	semi-monthly	semi-annually
Sulphate	quarterly	quarterly	quarterly
Tot. Phosphate	6-week intervals	semi-monthly	----
DO	6-week intervals	semi-monthly	monthly
Color	6-week intervals	semi-monthly	----
Volatile Acids	6-week intervals	monthly	----
Fecal coliform	quarterly	quarterly	semi-annually
Elect. Conductivity	6-week intervals	semi-monthly	monthly
Fecal Streptococci	semi-annually	semi-annually	semi-annually

---

*Initial test of Cell A leachate will include all parameters listed in December 1971 schedule in addition to those listed above.

PLATE F-4

SAMPLING SCHEDULE

Frequency of Fluid Sampling & Analysis

Revised May, 1973

Parameter	Leachate		Groundwater
	Cells A, B & E	Cells C & D	Wells 1 thru 4* A & E Subdrain* Water Supply Cell C
Alkalinity	6-week intervals	3-week intervals	quarterly
B.O.D.	6-week intervals	3-week intervals	semi-annually
Cadmium	6-week intervals	6-week intervals	quarterly
Calcium	6-week intervals	3-week intervals	quarterly
C.O.D.	6-week intervals	3-week intervals	quarterly
Chloride	6-week intervals	3-week intervals	quarterly
Copper	6-week intervals	6-week intervals	quarterly
Dissolved Oxygen	6-week intervals	3-week intervals	6-week intervals
Electrical Conductivity	6-week intervals	3-week intervals	6-week intervals
Fecal Coliform	semi-annually	semi-annually	semi-annually
Fecal Streptococci	semi-annually	semi-annually	semi-annually
Iron	6-week intervals	6-week intervals	quarterly
Lead	6-week intervals	6-week intervals	quarterly
Magnesium	6-week intervals	3-week intervals	quarterly
Mercury	6-week intervals	6-week intervals	quarterly
Nitrogen-Ammonia	6-week intervals	3-week intervals	semi-annually
Nitrogen-Organic	6-week intervals	3-week intervals	----
Nitrogen-Nitrate	6-week intervals	3-week intervals	semi-annually
Phosphate-total, as P	6-week intervals	3-week intervals	----
P.C.B.	semi-annually	semi-annually	(only if detected in cells)
Potassium	6-week intervals	6-week intervals	quarterly
Sodium	6-week intervals	6-week intervals	quarterly
Solids-Total Dissolved	6-week intervals	3-week intervals	quarterly
Solids-Settleable	------	quarterly	----
Total Sulphide	quarterly	quarterly	----
Sulphate	quarterly	quarterly	quarterly
Volatile Acids	6-week intervals	6-week intervals	----
Zinc	6-week intervals	6-week intervals	quarterly
pH	6-week intervals	3-week intervals	6-week intervals

---

*D.O., E.C. & pH to be run quarterly on Well 4 and A & E Subdrain.

PLATE F-5

SAMPLING SCHEDULE

Frequency of Gas Sampling & Analysis

Revised May, 1973

Gas Probe Location	Sampling Frequency
Cell A - Middle	6-week intervals
Cell B - Middle	6-week intervals
Cell C - Bottom	6-week intervals
Cell D - Top	6-week intervals
Cell E - Middle	6-week intervals

PLATE F-6

APPENDIX G

ANALYTICAL METHODS AND PROCEDURES FOR CHEMICAL ANALYSIS OF LEACHATE, GROUNDWATER AND GAS SAMPLES FROM SONOMA COUNTY CENTRAL DISPOSAL SITE SANITARY LANDFILL TEST CELLS

EMCON ASSOCIATES

December 1971
Revised February 1972
Revised June 1972
Revised June 1973
Revised June 1974

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GENERAL

Unless specifically noted, each analytical method is used to determine the specific constituent in all aqueous samples involved in this investigation. The taking, handling, and preservation of samples prior to analysis will vary according to the nature of the sample and constituent to be measured. Preanalytical preparations may require acidification, dilution, addition of a preservative, or filtration, to name some possibilities.

The samples handled in this research project include a broad range of concentrations and sample conditions. The analytical problems encountered include predicting the proper dilution ratio when samples are too concentrated, estimating sample volumes when low concentration of a given constituent is expected, and changing analytical procedures or methods when interferences occur. It may sometimes be necessary to use several methods for the same species, shifting the method to suit the special sample conditions.

SAMPLING PROCEDURES AND PREANALYTICAL PREPARATION

Sampling Procedures

In all cases and at all times taking and handling samples should be done in a manner which reduces to a minimum the possibilities for contamination and at the same time reduces to a minimum the time between sampling and analysis. The importance of conducting analysis as soon after sampling has been completed cannot be overemphasized.

Since there will be a significant time interval (several hours) between sampling and analysis, the samples for certain time dependent tests must be preserved in some manner to assure that the error due to chemical and biological change is held to a minimum. The methods used in this investigation are generally accepted and widely used (1, 2).

Sample Procurement

Samples, with the exception of those obtained for bacteriological tests, are collected in all-glass bottles with caps having polyseal liners. The glass sample bottles are prepared for use by cleansing with chromic acid followed by 1:1 nitric acid and several rinses of distilled water. When sufficient sample volume is available, the bottle is rinsed at least once with the sample fluid before filling the bottle to overflow capacity. The samples are then prepared according to specific preanalytical procedures described below.

Samples taken for bacteriological tests are collected in 125 ml plastic bottles with plastic caps. The bottles are prepared in the laboratory beforehand by washing and sterilization as described in Standard Methods* (page 403).

Sample Preservation

Depending upon the test series to be run, from one to four samples are taken from each source for chemical analysis. All samples are stored on ice or under refrigeration at or below 4°C until tested. A preservative, $HgCl_2$, in a concentration of 40 mg/l of sample is added to samples to be tested for the following components:

Alkalinity
Chemical Oxygen Demand
Calcium
Ammonia-N
Organic-N
Nitrate-N
Phosphate
Sulfate
Total Dissolved Solids
Total Suspended Solids
Settleable Solids

---

*Herinafter reference to Standard Methods indicates Reference 1.

DETECTION LIMITS

The detection limits listed below are the minimum detection limits valid for normal operating procedures in the laboratory. This list is provided as a guide for the evaluation of the analytical procedures.

Component	Detection Limit	Unit
Cd	0.05	mg/l
Cu	0.02	mg/l
Fe	0.1	mg/l
Hg	0.05	ug/l
K	0.1	mg/l
Mg	0.05	mg/l
Mn	0.1	mg/l
Na	0.05	mg/l
Pb	0.1	mg/l
Zn	0.01	mg/l
alkalinity	1	mg/l as $CaCO_3$
BOD	5	mg/l
Ca	1	mg/l
COD	1	mg/l
Color	4	color units
Cl	1	mg/l
Dissolved O_2	0.1	mg/l
Nitrogen - NH_3	0.5	mg/l as N
Nitrogen - Organic	0.5	mg/l as N
Phosphorus (as PO_4)	0.5	mg/l as P
Solids - TS	5	mg/l
Solids - TDS	5	mg/l
Solids - TSS	5	mg/l
Solids - Settleable	0.2	ml/l
SO_4	5	mg/l
Volatile acids	50	mg/l

ANALYTICAL METHODS AND PROCEDURES

Alkalinity

Alkalinity is determined by titration to a methyl orange end point. The sample is diluted to 50 ml with deionized water to give a reasonable titration volume and sharp end point. When severe color interferences are present, the sample is titrated to a pH 4.2 end point using a pH meter.

Biochemical Oxygen Demand (BOD)

The biochemical oxygen demand (BOD) determination is conducted according to the procedure given in Standards Methods (page 489). The direct pipeting or dilution method is selected for preparing BOD samples based upon the estimated ultimate 5-day BOD.

For samples containing unknown BOD strengths it is necessary to prepare a range of dilutions so that the actual value will be bracketed. Generally three dilutions are required to assure adequate coverage of range. If the BOD can be reasonably estimated, the range of dilutions can be narrowed somewhat, but it is usually best to take a conservative approach. The following table will aid in preparing dilutions:

ESTIMATED BOD DILUTIONS*

Sample Volume - ml (added to 300 ml bottle)	Range of BOD Expected mg/l
0.05	12,000 - 42,000
0.10	6,000 - 20,000
0.20	3,000 - 10,000
0.50	1,200 - 4,200
1.0	600 - 2,000
2.0	300 - 1,000
5.0	100 - 400
10.0	60 - 200
20.0	30 - 100
50.0	10 - 40
100.0	5 - 20
300.0	0 - 7

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* Modified and shortened from Sawyer & McCarty, Chemistry for Sanitary Engineers, McGraw-Hill. 2nd ed., 1967. p 403.

Calcium and Magnesium

The concentration of calcium is determined by complexometric titration with EDTA with hydroxy napthol blue indicator. There is a strong possibility of interference from dissolved heavy metals (e.g., Cu, Zn, Ni, Fe, Pb). This interference is overcome by complexing the metals with cyanide*. Routine addition of sodium cyanide solution is utilized to prevent potential metallic interference. The procedure is described in Standard Methods (page 181). When sample volumes do not permit titration techniques, Atomic Absorption Spectrophotometry (AAS) should be used to conserve the sample volume for measurement of other parameters. The methods described in Standard Methods (page 211) and elsewhere[10] can be used. Where highly colored leachate samples are obtained it may be necessary to analyze Ca and Mg by AAS to avoid color interferences with the EDTA method. Mg is routinely determined by AAS but in certain favorable cases may be done by EDTA titration.

Chemical Oxygen Demand (COD)

The dichromate reflux method, Standard Methods (page 495), has been selected for the chemical oxygen demand (COD) determination because it has advantages over other oxidants in oxidizability, applicability to a wide variety of samples, and ease of manipulation. The sample and reagent volumes used are 20 ml aliquot of sample, 10 ml of .25N $K_2 Cr_2 O_7$ and 30 ml of $H_2 SO_4$ containing Ag_2SO_4. The maximum COD concentration which can be determined using the 20 ml aliquot sample is 2000 mg/l; for COD concentrations greater than 2000 mg/l, smaller volumes of sample diluted up to 20 ml with distilled water should be used. The sample is diluted to give reasonable titration volumes and to assure complete sample oxidation.

The standard ferrous ammonium sulfate titrant is approximately 0.10N, and is standardized with each run. When data indicate a COD consistently below 500 mg/l, the normal procedure described in Standard Methods (page 495) is to be employed.

---

*CAUTION: Cyanide is a strong poison and great care should be exercised when handling.

Chloride

Because of the interferences expected in leachate samples, the method used for chloride analysis is the Mercuric Nitrate procedure. It is expected that orthophosphate, sulfide, and sulfite ions will be in sufficient concentrations so as to interfere with the Argentometric titration technique. The procedure as outlined in Standard Methods (page 97) is used. The presence of sulfites interferes. If the presence is suspected, oxidize by treating 50 ml sample with 0.5 to 1.0 ml of 30 percent H_2O_2. This method is used for both leachate and groundwater samples.

Color

Color is measured according to the Platinum-Cobalt method described in Standard Methods (page 160). Because of the highly colored, complex character of leachate, this test is no longer performed.

Dissolved Oxygen (DO)

Most leachate samples are highly colored and it is therefore not possible to use the Winkler Method of analysis. A field oxygen probe is used for in-situ measurement of oxygen in both leachate and groundwater samples.

Dissolved oxygen is measured in the field using a battery operated Yellow Springs Instrument Co., Model 51A Dissolved Oxygen Meter. The instrument is equipped with a combination temperature, oxygen probe. Temperature can be read to 0.3° C and dissolved oxygen can be read to 0.1 ppm.

Below is a detailed description for use by field personnel who will be making the in-situ DO measurements:

1. Calibration of DO meter.
    a. Check the probe to assure the membrane is not damaged. Should the membrane be damaged, it can be replaced following the procedures outlined under "Preparation for Operation" in the instruction manual.

b. Connect the probe cables to the instrument. The oxygen-temperature probes have two connectors of different sizes so they cannot be incorrectly attached to the instrument.

c. With the instrument OFF check mechanical zero of meter and adjust if necessary with the screwdriver adjustment in the lower center of the meter bezel. Perform the adjustment with the instrument in the position it will be used.

d. Turn the selector switch to ZERO and adjust the meter to zero with ZERO adjustment knob.

e. Turn the selector switch to FULL SCALE and adjust the meter to the full scale position (15 ppm on the meter). If the meter cannot be adjusted to full scale, replace the batteries.

f. Set the selector switch to CALIB O_2 with theprobe in an environment of 100 percent relative humidity. This can be accomplished by placing the probe in the storage container partially filled with water, taking care that the membrane is not immersed. Leave the probe in this position for a period of 5 minutes to polarize it before making further calibrations or measurements.

g. With the CALIB knob, set the meter pointer to the mark for the local altitude.

2. Measurement of Sample DO Content.

   a. Calibrate DO meter as outlined in calibration procedures.

   b. Place the probe in the water sample at the measurement site. To induce a flow of water across the membrane, raise and lower the probe.

   c. Turn the selector switch to TEMP and read the temperature from the lower meter scale. Record temperature.

d. Set the O_2 SOLUBILITY FACTOR dial to the observed temperature, taking care to use the appropriate salinity index (each section of the bar on the O_2 SOLUBILITY FACTOR dial represents 5,000 ppm chloride concentration). Previous analytical data on chloride concentration should be used to estimate appropriate salinity index setting.

e. Turn the switch to O_2 and read the dissolved oxygen value in ppm directly from the meter dial. Record dissolved oxygen value.

f. To perform a series of measurements in a short time at about the same temperature (within 5° C of calibration temperature), recalibration is not required and performance will not be degraded. To take readings, simply repeat steps b, c, d, and e.

Electro-Conductivity (EC)

Electro-conductivity is measured in the field using a battery operated Beckman, Type RB3, Solu Bridge. The instrument is equipped with three conductivity probe cells which provide a measurement range of from 50 to 200,000 micro-mhos/cm.

Below is a detailed description for use by field personnel who perform the in-situ E. C. measurements:

1. Check the battery by depressing the battery check switch and the ON-OFF button simultaneously. The needle of the battery check meter should deflect to the right (positive) and come to rest in the green zone.

2. Set the manual temperature compensator to the solution temperature as measured by a thermometer or the reading from the D. O. meter. Record the temperature of the sample.

3. Immerse the conductivity probe cell in the solution to be tested to a point at least one-half inch above the cell air vent. Move the cell up and down in the solution once or twice to insure removal of air bubbles from within the cell.

4. While depressing the ON-OFF button, rotate the main scale knob until the meter needle is opposite zero on the scale. Release the button.

5. Read the scale value opposite the index mark on the main scale knob. Determine the electro-conductivity by applying the appropriate conductivity probe cell factor to the scale value. Record electro conductivity.

6. Instrument calibration is carried out in the laboratory utilizing solutions described in Standard Methods (p. 325).

7. Clean the probe by rinsing with tap water several times. Probes should be stored in distilled water when not in use.

Fecal Coliform

The multiple tube dilution technique is used for the Fecal Coliform Test. Lactose broth is used for the presumptive test. The confirmed test utilizes the boric acid lactose broth. Details are given in Standard Methods (page 669). Data are reported as Most Probable Number (MPN) per 100 ml with a 95% confidence limit.

Fecal Streptococci

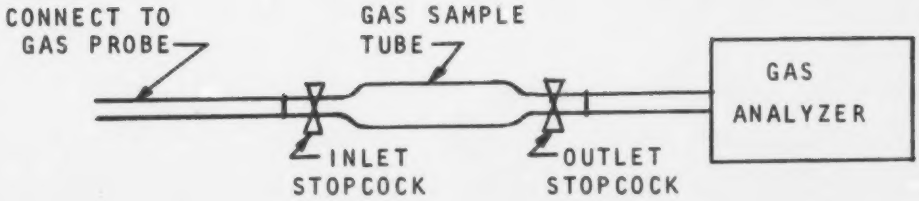
The Multiple-Tube Technique is used for Fecal Streptococci analysis. The Membrane Filter Technique could be used equally well. The procedure used for the presumptive test, confirmed test, and for computing and recording the MPN per 100 ml of the samples is given in Standard Methods (page 689).

Gas Analysis

Gas samples from the landfill cells are collected in the field and are analyzed in the laboratory using gas-solid partition chromatography. The system will separate and detect CO_2, H_2, N_2, O_2 and CH_4. The presence or absence of H_2S is also checked.

Sampling Procedure: Gas samples are collected in the field in 250 ml glass gas sampling tubes. The principle is to draw the gas sample into and through the sample tube under a vacuum and to seal the container when a representative sample has been collected. Procedure for collection of gas samples is as follows:

1. Connect tubing from gas probe to gas sample tube inlet.
2. Connect the suction end of the field gas analyzer to gas sample tube outlet.
3. Open stopcocks on both ends of gas sampling tube.
4. Switch on field gas analyzer and draw sample through gas sample tube into gas analyzer until parts per million reading remains fairly constant, but for not less than one minute. (Pumping rate is approximately 1400 ml/min.)
5. Close sample tube outlet stopcock.
6. Close sample tube inlet stopcock.
7. Disconnect the gas sample tube outlet from the field gas analyzer.
8. Connect the hand vacuum pump to the gas sample tube outlet.
9. Open the stopcock at the outlet of the gas sample tube.
10. Pump with the hand vacuum pump for 20 repetitions (equal to approximately 26" of Mercury pressure) to evacuate the sample tube.
11. Close the stopcock at the outlet of the gas sample tube.
12. Reconnect and switch on the field gas analyzer.
13. Open the inlet stopcock, then the outlet stopcock of the gas sample tube.
14. Continue pumping for 30 seconds.
15. Close sample tube outlet stopcock.
16. Close sample tube inlet stopcock.
17. Disconnect gas sample tube from gas probe and field gas analyzer. Care should be taken not to disturb either stopcock while transporting and handling the gas sample tube. Record on the gas sample tube the container number, sampling location, and date.



Heavy Metals

Analysis for five heavy metals (Hg, Pb, Zn, Cu, Cd) is done by Atomic Absorption Spectrophotometry. Pb, Zn, Cu, and Cd are run by the normal flame method as described in Standard Methods (page 417).

Mercury is analyzed for by the flameless atomic absorption technique similar to that prescribed by EPA Methods* (page 121). Additional information on this technique is available (6, 7). Details of the analytical procedure are presented below:

Total Mercury Analysis

The following method for the determination of Mercury in solution employs a preanalytical acid oxidation procedure followed by a simple reduction aeration procedure to produce and introduce elemental mercury vapor into a flow-through system where absorption at 253.7 nm is measured in a quartz-windowed cell. This method applies to both groundwater and leachate samples, although the sample volume may have to be increased for the groundwater samples.

The range of the method may be varied through instrument and/or recorder expansion. Using a 25 ml sample, a detection limit of 1.0 μHg/l can be maintained. Concentrations below this level should be reported as 1.0.

1. Acid Oxidation Procedure
    a) Place a sample aliquot of 50 ml into a 500 ml. volumetric flask. Add 10 ml concentrated, redistilled HNO_3, cool and

then add 15 ml of conc. H_2SO_4. Because of the potential for loss of Hg by volatilization, the sample must not be allowed to become hot. Stopper the flasks and allow to stand for 24 hours.

b) Add 25 ml of $KMnO_4$ to each sample. If the color persists for at least one hour the oxidation can be considered complete. If the color dissipates in less than 30 minutes, add $KMnO_4$ in 5 ml aliquots until the color persists. It is important that aliquot oxidation be carried to completion, as unoxidized surfactants will foam, resulting in a poor analysis.

c) Add 10 ml of 5% persulfate solution to each aliquot and allow to stand at least several hours to overnight. Before diluting to volume, discharge the color using hydroxylamine solution. When sample is ready for analysis it should be clear.

d) Make up to volume.

2. Analytical Procedure

a) Transfer the sample to the gas washing bottle. The method calls for the removal of 100 ml aliquots of both standards and sample; however, larger or smaller volumes may be utilized with suitable correction factors applied. Add teflon stirring bar and stir at moderate speed.

b) Add 4 ml stannous chloride, wait 5-10 seconds for complete mixing and insert the aerator. The recorder should register a peak reaching maximum height in approximately 1-3 seconds. When the maximum peak height has been obtained, remove the aerator and insert in another washing bottle containing 5 ml of 7 N HNO_3 in 100 ml distilled water. The recorder should return to zero as the eluted mercury is driven from the cell.

3. Calibration

Standards, including a blank are treated in a similar manner as the samples. Standards commonly employed are 0.0, 0.05, 0.1, 0.25, 0.5, and 1.0 μg/100 ml.

4. Calculation

Percent absorption is read from the chart and converted to absorbance. Absorbance is plotted vs. ug Hg, which should give a linear curve. Sample values are derived from the resulting graph.

$$\text{mg Hg/l} = \frac{\text{final dilution volume}}{\text{sample size}} \times \frac{\mu\text{g Hg in aliquot}}{\text{aliquot size}}$$

for a 50 ml sample diluted to 500 ml with 100 ml aliquot taken:

$$\text{mg Hg/l} = \frac{\mu\text{g Hg in aliquot}}{10}$$

for 200 ml:

$$\text{mg Hg/l} = \frac{\mu\text{g Hg}}{20}$$

Reagents

a) HNO_3: redistilled, conc., stored in pyrex
HCl: redistilled, conc., stored in pyrex
H_2SO_4: conc., stored in pyres or high density polyethlene

b) Diluting water: must be known to be Hg free; if it is not, appropriate measures must be taken to assure adequate quality water.

c) Stannous chloride: 10% w/v in 1:1 HCl. Dissolve 50 g of $SnCl_2$ in 250 ml of conc. HCl then dilute to 500 ml. This should be purged with air for several hours before use to remove any residual mercury.

d) Sodium chloride: 30% w/v solution

e) Hydroxylamine hydrochloride: 25% w/v solution

f) Sodium chloride - hydroxlylamine: dilute 60 ml of 25% hydroxylamine HCl and 50 ml of NaCl to 500 ml.

g) Potassium permanganate: 5% w/v (Saturated solution)

h) Potassium persulfate: 5% w/v saturated solution, store in cool, dark place. Solution stable for limited period of time.

5. Apparatus

a. Atomic Absorption Spectrophotometer. Any atomic absorption unit which is capable of accommodating the cold vapor cell. Instrument settings recommended by the manufacturer should be followed.

b. Hg Hollow Cathode Lamp.

c. Recorder. Any multi-range variable speed strip chart recorder campatible with the UV detection system in use.

d. Cold Vapor Absorption Cell. Suitable cells may be constructed from standard spectrophotometric 10 mm cells having quartz end window or may be constructed from plexiglass tubing making sure to use quartz end windows that are perpendicular to the line of light. See Reference 1, 6 or 7 for exact details.

Nitrogen

Ammonia. The preliminary distillation method is used for ammonia as described in Standard Methods (page 229). The distillation method covers the determination of ammonia-nitrogen exclusive of total Kjeldahl nitrogen. This method covers the range from about 1.0 to 25 mg/l when the titrometric end point is used. Since most leachate samples will contain NH_3-N in the range 100-600 mg/l, it will be necessary to use small sample volumes (20-400 ml) and dilute with ammonia-free distilled water up to 50 ml.

Organic Nitrogen. Organic Kjeldahl nitrogen is defined as the nitrogen converted to ammonia from nitrogen components of biological origin such as amino acids, proteins and peptides, but may not include the nitrogenous compounds such as amines, nitro compounds, hydrazones, oximes, semi-carbazones and refractory tertiary amines. Organic Kjeldahl nitrogen is determined after distillation of free ammonia from the sample. The method used is described in the EPA Methods (page 149) and is similar except for minor details to the procedure detailed in Standard Methods (page 244).

Nitrate Nitrogen. The Brucine Method employed for the measurement of nitrate nitrogen is described in EPA Methods (page 170). This method is based upon the reaction of the nitrate ion with brucine sulfate* in a 13N H_2SO_4 solution at a temperature of 100° C. The color of the resulting complex is measured at 410 nm. Temperature control of the color reaction is extremely critical. Details of the analytical procedure are presented below:

Brucine Method

This method is applicable to the analysis in both groundwater and leachate samples. Modification can be made to remove or correct for turbidity, color, salinity, or dissolved organic compounds in samples. The range of the method is 0.1 to 2 mg/l NO_3-N.

Samples may be preserved for several days by the addition of 40 mg/l $HgCl_2$ and storage at 4°C. Analysis should not be delayed more than a week.

1. Points to Note.
   a. Dissolved organic matter will cause an off color in 13NH_2SO_4 and must be compensated for by additions of all reagents except the brucine-sulfanilic acid reagent. This also applies to natural color present not due to dissolved organics.

   b. The effect of salinity is eleiminated by addition of sodium chloride to the blanks, standards, and samples.

   c. Ferrous and ferric iron and quadrivalent manganese give slight positive interference. In concentrations less than 1 mg/l these are negligible.

   d. All strong oxidizing or reducing agents interfere. The presence of oxidizing agents may be determined by the addition of orthotolidine reagent.

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* Brucine Sulfate is toxic; reagent bottle should be marked with warning.

e. Uneven heating of the samples and standards during the reaction time will result in erratic values. The necessity for absolute control of temperature during the critical color development period cannot be too strongly emphasized.

2. Analytical Procedure

a. Adjust the pH of the samples to approximately pH 7 with 1:3 acedic acid and, if necessary, filter through a 0.45 μ pore size filter.

b. Set up the required number of matched tubes in the rack to handle reagent blank, standards and samples. It is suggested that tubes be spaced evenly throughout the rack to allow for even flow of bath water between the tubes. Even spacing of tubes should assist in achieving uniform heating of all tubes.

c. If it is necessary to correct for color or dissolved organic matter which will cause color on heating, a set of duplicate tubes must be used to which all reagents except the brucine-sulfanilic acid has been added.

d. Pipette 10.0 ml or an aliquot of the samples diluted to 10.0 ml into the sample tubes.

e. If the samples have high dissolved solids, add 2 ml of the 30 percent sodium chloride solution to the reagent blank, standards, and samples. For groundwater samples, sodium chloride solution may be omitted. Mix contents of tubes by swirling and place rack in cold water bath (0-10°C).

f. Pipette 10.0 ml of sulfuric acid solution into each tube and mix by swirling. Allow tubes to come to thermal equilibrium in the cold bath. Be sure that temperatures have equilibrated in all tubes before continuing.

g. Add 0.5 ml brucine-sulfanilic acid reagent to each tube (except the interference control tubes) and carefully mix by swirling, then place the rack of tubes in the boiling water bath for exactly 25 minutes.

CAUTION: Immersion of the tube rack into the bath should not decrease the temperature of the bath more than 1° to 2° C. Flow of bath water between the tubes should not be restricted by crowding too many tubes into the rack, in order to keep this temperature decrease to an absolute minimum. If color development in the standards reveals discrepancies in the procedure, the operator should repeat the procedure after reviewing the temperature control steps.

h. Remove rack of tubes from the hot water bath and immerse in the cold water bath and allow to reach thermal equilibrium (20-25°C.).

i. Dry tubes and read absorbance against the reagent blank at 410 nm.

3. Calculation

a. Obtain a standard curve by plotting the absorbance of standards run by the above procedure against mg NO_3-N. (The color reaction does not always follow Beer's law).

b. Subtract the absorbance of the sample without the brucine-sulfanilic reagent from the absorbance of the sample containing brucine-sulfanilic acid and read the absorbance in mg NO_3-N. Convert mg per aliquot of sample to mg per liter.

4. Reagents

a. Distilled water free of nitrite and nitrate is to be used in preparation of all reagents and standards.

b. Sodium chloride solution (300 g/l). Dissolve 300 g NcCl in distilled water and dilute to 1.0 l.

c. Sulfuric acid solution. Carefully add 500 ml H_2SO_4 (sp. gr. 1.84) to 125 ml distilled water. Cool and keep tightly stoppered to prevent absorption of atmospheric moisture.

d. Brucine-sulfanilic acid reagent. Dissolve 1 g brucine sulfate $(C_{23}H_{26}N_2O_4)_2 \cdot H_2SO_4 \cdot 7H_2O$ and 0.1 g sulfanilic acid ($NH_2C_6H_4SO_3H \cdot H_2O$) in 70 ml hot distilled water. Add 3 ml concentrated HCl, cool, mix and dilute to 100 ml. Store in a dark bottle at 5°C. This solution is stable for several months; the pink color that develops does not effect its usefulness. Mark bottle with warning: CAUTION: Brucine Sulfate is toxic; take care to avoid ingestion.

e. Potassium nitrate stock solution (1 ml = 0.1 mg NO_3-N). Dissolve 0.7218 g anhydrous potassium nitrate (KNO_3) in distilled water and dilute to 1 liter.

f. Potassium nitrate standard solution (1 ml = 0.001 mg NO_3-N). Dilute 10.0 ml of the stock solution to 1 liter. This standard solution should be prepared fresh weekly.

g. Acetic acid (1+3). Dilute 1 vol. glacial acetic acid (CH_3COOH) with 3 volumes of distilled water.

5. Apparatus

a. Spectrophotometer or filter photometer suitable for measuring absorbance at 410 nm and capable of accommodating 25 mm diameter cells.

b. Sufficient number of 25 mm diameter matched tubes for reagent blanks, standards, and samples.

c. Neoprene coated wire racks to hold 25 mm diameter tubes.

d. Water bath suitable for use at 100°C. This bath should contain a stirring mechanism so that all tubes are at same temperature and should be of sufficient capacity to accept the required number of tubes without significant drop in temperature when the tubes are immersed.

e. Water bath suitable for use at 10-15°C.

Measurement of pH

pH is measured in the field using a battery operated Beckman Electromate pH Meter. The instrument is equipped with a combination electrode and normal operating procedures will assure a precision of ± 0.1 pH unit.

The following is a detailed description of test procedures for use by field personnel who will be making the in-situ pH measurements. It is important that explicit care be taken to assure as great an accuracy and precision as can be maintained since field measurements are unduly subject to possible error.

1. Calibration of pH meter and electrode.

   a. Check the battery power supply to assure adequate power.

   b. Check to make sure that the pH meter is in the proper operating mode. Turn function switch to STANDBY, temperature compensation to the temperature of samples and buffers.

   c. Be sure that the samples and buffers are at the same temperature before calibrating instrument.

   d. Rinse off electrode with distilled water and dry gently with soft tissue paper.

   e. Place the combination electrode into the buffer solution pH 7. Turn function switch to pH and after several minutes adjust the meter reading to the pH of the buffer solution by using the "standardize" dial.

   f. Turn function switch to STANDBY. Remove combination electrode from buffer solution, rinse with distilled water, and dry.

g. Repeat e. and f. for buffer of pH 4.

2. Measurement of Sample pH.
   a. Use of the combination electrode allows measurement of pH in small beakers. Use a clean 50 ml or 100 ml beaker. Insert the combination electrode in sample. The electrode must not touch the sides or bottom of the beaker. Turn function switch to pH. Slowly rotate the beaker several times to insure good contact of sample and electrode. When meter reading has been stabilized, record pH.
   b. Turn function switch to STANDBY and remove electrode Rinse electrode with distilled water and dry carefully with soft tissue.
   c. Repeat procedure for each sample.
3. Storage and care of combination electrode.
   a. The salt solution in the reference part of the electrode should be topped off occasionally to assure an adequate level is maintained.
   b. The rubber sleeve should be kept over the fill hole except when equilibrating pressure or filling with salt solution.
   c. The electrode should be stored in a manner that keeps the electrode tip wet at all times.

Phosphate - Total

Digestion of Raw Sample: The sulfuric acid - nitric acid digestion method will be used to prepare samples for analysis of total phosphate. The method follows the description in Standard Methods (page 525). Additional information on this digestion method can be found elsewhere.[8]

When necessary, the persulfate digestion method, Standard Methods (page 526), will be used in lieu of the above.

Analytical Method: The vandomolybdo-phosphoric acid colorimetric method described in Standard Methods (page 527) is applicable to the measurement of total phosphate in the leachate samples. Arsenates interfere with the analysis above 0.05 mg/l arsenic. This method for total phosphate is adequate for the full range of 0.03 to 2.0 mg/l as P.

When necessary, the above specified analytical method will be replaced by the ascorbic acid - molybdate method, Standard Methods (page 532).

Polychorinated Biphenyls (PCB)

Since the chlorinated compounds are generally quite surface active, most of the PCB is expected to be on the suspended material. The suspended matter, after separation on a glass fiber disc, is extracted by agitation in 1:1 acetone:acetonitrite. Chlorinated pesticides are partitioned into petroleum ether after the addition of a weak salt solution. The extract is cleaned up on florisil before gas-liquid chromatography detection of the chlorinated materials.

This method is suitable for aqueous samples with or without large amounts of suspended matter. The detection limit is 10 nanograms per liter of sample. Therefore it is very important that extraordinary cleanliness be maintained to avoid contamination.

Analytical Method

Samples containing 1 gm/l or more suspended matter must be filtered (Section 1) and the filtrate and suspended matter analyzed separately as discussed in Section 3 (water) and Section 2 (sediment). Samples having less than 1 gm/l suspended material can be analyzed as a whole sample according to Section 3.

1. Filtration of Heavily Sedimented Samples
    a. Place a 7 cm. Whatman GF/B filter pad (or equivalent) in a porcelain Buchner funnel and prewash with 50 ml distilled petroleum ether. Discard the washings.
    b. Measure out 1 liter of homogeneous sample and filter using suction.
    c. Transfer the filtrate to a 2 liter separatory funnel and proceed according to Section 3.
    d. Transfer the filter pad to a 600 ml beaker with clean forceps and proceed according to Section 2.
2. Extraction Procedure for Sediment Fraction
    a. Add 100 ml of 1:1 acetonitrile:acetone and 50 ml distilled water to beaker containing the filter pads. Allow contact for more than 2 hours with occasional stirring.
    b. After 2 hours remove the sediment from the filter pad by mascerating the pad with two clean glass stirring rods.
    c. Allow the sediment to settle and decant the clear supernatant using the stirring rods to hold back the glass filter fibers. Decant into 1000 ml of distilled water in a 2 liter separatory funnel.

d. Repeat the partitioning with two additional 50 ml portions of 1:1 acetonitrile:acetone, each time allowing the sample to soak for more than one hour with occasional swirling. Decant the clear supernatant into the separatory funnel. This should bring the total volume up to 200 ml of extractant.

e. Add 30 gm Na_2SO_4 and extract two times with 150 ml petroleum ether, each time washing the petroleum ether twice with 100 ml distilled water which is added to the rest of the aqueous sample. (This is done to wash acetonitrile and acetone out of the petroleum ether so they will not interfere with the florisil cleanup.) If heavy emulsion occurs at this point, as it may with dirty samples, include the emulsion with the aqueous phase each time and partition a third time with 150 ml petroleum ether.

f. Carry through with evaporation, florisil cleanup and detection as described in Section3 for aqueous samples.

3. Extraction Procedure for Aqueous Fraction

a. Add 150 ml of redistilled 15% diethyl ether in petroleum ether to the sample. Shake vigorously for 3 minutes. Settle for at least 10 minutes.

b. Draw off and save the aqueous phase.

c. Swirl the organic phase to dislodge water from the sides of the funnel.

d. Draw the organic phase into a clean 600 ml beaker.

e. Return the aqueous phase to the separatory funnel and repeat steps a-d with another 150 ml 15% ethyl ether in petroleum ether.

f. Repeat steps a-d with 150 ml petroleum ether (no ethyl ether).

g. Prepare a large funnel with a small cotton plug and 2 teaspoons of Na_2SO_4. Wash this with 50 ml petroleum ether.

h. Pour the sample through Na_2SO_4 to dry it and catch the sample in a clean 600 ml beaker.

i. Follow the sample with another 25 ml petroleum ether to wash the Na_2SO_4 and catch this washing in the beaker containing the sample.

j. Place the sample beaker in a 45°C water bath and evaporate to about 25 ml volume (about 2 hours). This evaporation can also be accomplished in a K-D evaporator.

k. Prepare a 4-inch florisil column and prewash with 50 ml petroleum ether. Discard the washing.

l. Follow the prewash with the sample. Add 150 ml of 1% (V/V) ethyl ether in petroleum ether and then 150 ml of 20% (V/V) ethyl ether in petroleum ether.

m. Add 100 microliters of distilled xylene to each elutriated volume.

n. Evaporate the collected volume to about 1 ml volume in a K-D evaporator.

o. Cool the evaporator under a cold water stream and wash down the large flask with the condensed solvent.

p. Reduce the sample down to an injectable quantity as rapidly as possible in a 45°C water bath. Thoroughly mix the contents before GLC detection.

q. Initial detection is done by GLC using 3% OV-1 and the Nicher-63 electron capture dector. Confirmation of positive amounts of chlorinated hydrocarbons is first done on 3% OV-17 using a Coulson electrolytic conductivity halide specific detector and then on 5% OV-17 plus 2% QF-1 using a Dohrmann micro-coulometric chloride specific detector.

Sodium and Potassium

The preferred method of analysis for sodium and potassium utilizes the flame photometer technique. Standard analytical procedures are followed as described in Standard Methods (page 317 and 283).

Satisfactory results can also be achieved by Atomic Absorption Spectrophotometry.

Sulfate

Sulfate is determined by a gravimetric method utilizing precipitation with barium chloride, forming a barium sulfate solid. The filtered precipitate is ignited at 800°C for 1 hour prior to cooling and weighing. This method is used for both leachate and groundwater samples. Care must be taken with leachate samples to avoid error caused by precipitation of barium chloride during the sulfate analysis. The gravimetric method is described in detail in Standard Methods (page 331).

Settleable Solids

Settleable matter is determined according to the procedure given in Standard Methods (page 539) using the Imhoff cone.

Total Dissolved Solids (TDS)

Total dissolved solids is determined according to the procedure described in Standard Methods (page 290). There may be a significant dissolved organic fraction present in the leachate samples so that correspondence between specific conductance and TDS may be different from that of the groundwater samples.

Total Suspended Solids (TSS)

The analytical procedure employed for determining suspended solids was originally described by Wycoff (4). Suspended solids are determined by leachate filtration through a glass fiber filter pad. The initial weight of each pad is determined before filtration. Following filtration, the pads are dried for one hour at

103°C and then weighed. The glass pads are weighed again after being ignited for 10 minutes at 600°C if the volatile fraction is to be determined. The method utilized is described in Standard Methods (page 537).

Volatile Acids

Volatile acids (total organic acids) is measured by the column-partition chromatographic method as given in Standard Methods (page 577). Special precaution should be exercised in maintaining the normality of the standard sodium hydroxide titrant by excluding CO_2 from the reagent bottle.

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APPENDIX H

MONITORED DATA

TABLE OF CONTENTS

TITLE	PLATE NO.
Thermistor Readings	H-1A, 1B, 1C
Gas Probe Readings	H-2A, 2B (Discontinued)
Laboratory Gas Analysis - Cell A & B	H-3A, 3B, 3C
Laboratory Gas Analysis - Cell C & D	H-4A, 4B, 4C
Laboratory Gas Analysis - Cell E	H-5A, 5B
Leachate Analysis - Cell A	H-6A, 6B, 6C, 6D
Leachate Analysis - Cell B	H-7A, 7B, 7C, 7D
Leachate Analysis - Cell C	H-8A -8L
Leachate Analysis - Cell D	H-9A -9K
Leachate Analysis - Cell E	H-10A - 10E
Water Analysis - Water Added to Cells B & C	H-11A - 11E
Groundwater Analysis - Well 1	H-12A - 12E
Groundwater Analysis - Well 2	H-13A - 13E
Groundwater Analysis - Well 3	H-14A - 14E
Groundwater Analysis - Well 4	H-15A, 15B, 15C, 15D
Groundwater Analysis - Original Geotechnical Investigation	H-16A
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Observation Wells and Piezometers	H-18A
Cumulative Leachate Production	H-19A, 19B, 19C, 19D
Cumulative Leachate Production	H-20A (Discontinued)
Lysimeter Samples - Field Analysis	H-21A
Solution Analysis	H-22A (See Table 11)
Record of Rainfall, Evaporation and Runoff	H-23A- 23FF
Settlement Data	H-24A - 24E
Fluid Routing - Cell C	H-25A - 25K
Fluid Routing - Cell D	H-26A - 26K

THERMISTER READINGS

DATE	TIME	AIR TEMP.	CELL A Temperature °C			CELL B Temperature °C			CELL C Temperature °C			CELL D Temperature °C			CELL E Temperature °C		
			Bot.	Mid.	Top	Bot.	Mid.	Top	Bot.	Mid.	Top	Bot.	Mid.	Top	Bot.	Mid.	Top
1971																	
11-8	PM	25.8	17.1	-	-												
11-10	AM	24.5	26.6	19.1	-												
	PM	22.3	26.8	26.6	-												
11-11	AM	-	27.8	27.5	-												
11-12	AM	-	29.6	27.8	-												
11-14	AM	9.1	25.1	29.5	18.5												
	PM	-	24.8	29.2	19.1												
11-15	AM	9.8	24.2	28.4	27.6												
11-16	AM	13.2	22.4	28.4	42.5												
	PM	21.4	22.6	28.2	43.9										18.2		
11-17	AM	7.0	22.5	27.9	35.7										22.5		
	PM	20.3	22.3	27.9	33.4										24.5		
11-18	AM	13.5	22.3	27.5	28.6	18.1									30.7		
	PM	20.1	22.3	27.5	27.7	-									22.7		
11-19	AM	9.7	22.2	27.7	26.1	22.6	13.8								24.5		
	PM	17.5	22.2	27.6	25.8	22.8	19.4								25.2		
11-22	AM	7.2	21.9	27.1	24.0	22.4	25.5								30.7	19.6	
	PM	17.5	21.9	27.1	24.0	22.6	25.6								31.0	19.9	
11-23	AM	10.0	21.8	27.0	24.0	23.2	26.6								31.4	-	
	PM	12.0	21.8	27.0	23.9	23.2	27.4								31.3	20.1	
11-24	AM	10.5	21.8	27.0	23.9	23.4	28.9								31.5	20.3	
	PM	10.0	21.8	26.9	23.5	23.4	29.1								31.3	20.6	
11-29	AM	-	21.7	26.4	23.2	23.9	34.4								29.3	26.2	
11-30	AM	6.4	21.6	26.3	21.9	24.1	35.1								29.0	26.1	
	PM	21.0	21.6	26.3	21.9	24.2	35.2								28.9	27.1	
12-1	AM	10.1	21.7	26.5	21.7	24.4	35.5								28.9	27.8	
12-2	AM	7.5	21.6	26.2	21.4	24.7	35.7	20.6							28.6	28.8	
	PM	7.5	21.5	26.1	21.2	24.6	35.7	22.2							28.5	28.9	
12-3	AM	6.7	21.6	26.0	21.3	24.5	35.6	21.0							28.5	28.7	
12-6	AM	15.0	21.4	26.1	19.9	25.7	34.8	19.7							27.9	32.0	
	PM	18.1	21.4	25.8	19.7	25.7	34.7	20.9							27.9	32.0	
12-7	AM	12.5	21.4	25.8	19.1	25.9	34.4	21.7							27.9	32.5	
12-8	PM	15.4	21.4	25.6	18.8	29.3	33.1	21.7							27.8	32.8	
12-9	AM	12.1	21.6	25.6	18.3	29.7	32.9	22.7							27.8	33.0	
12-10	AM	15.0	21.4	25.5	17.8	30.5	32.7	22.6							27.8	33.1	

PLATE H-1A

THERMISTER READINGS

DATE	TIME	AIR TEMP.	CELL A Temperature °C			CELL B Temperature °C			CELL C Temperature °C			CELL D Temperature °C			CELL E Temperature °C		
			Bot.	Mid.	Top	Bot.	Mid.	Top	Bot.	Mid.	Top	Bot.	Mid.	Top	Bot.	Mid.	Top
1971																	
12-13	AM	11.5	21.3	24.9	16.6	30.4	32.1	21.4	31.6	22.6	-				28.0	32.8	19.2
12-14	AM	11.7	24.3	25.6	22.6	31.8	39.9	25.6	32.5	25.4	20.2				24.0	27.5	17.4
12-15	AM	11.3	21.7	25.1	16.1	30.2	31.9	21.3	30.1	23.7	24.2				27.9	33.4	18.8
12-16	PM	14.4	21.6	25.0	15.7	30.1	31.9	21.3	29.7	24.7	21.1				28.0	33.4	18.4
12-17	PM	14.3	-	-	-	29.8	31.6	21.2	29.3	25.4	20.0	11.3			-	-	-
12-20	PM	9.9	21.4	24.5	14.6	28.9	30.9	20.9	28.3	26.2	17.3	16.1			28.0	33.0	16.7
12-21	AM	6.6	-	-	-	-	-	-	-	-	-	17.7			-	-	-
12-28	PM	-	21.3	21.3	13.9	26.9	29.2	20.0	26.6	26.1	14.6	19.5	21.2	23.2	28.0	31.8	14.5
12-29	PM	-	21.2	23.7	13.7	26.7	28.8	19.8	26.4	26.0	14.5	19.5	22.1	24.3	27.8	31.5	14.1
12-30	AM	-	-	-	-	-	-	-	26.3	25.8	14.4	19.5	22.5	22.4	-	-	-
1972																	
1-11	AM	-	20.7	22.5	12.8	27.2	27.1	18.6	24.5	25.0	11.5	19.9	16.4	15.2	26.9	29.2	10.9
1-18	PM	-	20.5	22.0	11.1	24.2	25.3	17.3	23.8	20.3	10.7	15.9	15.1	13.7	26.1	27.4	10.9
1-27	AM	-	20.8	21.7	13.8	24.0	24.1	17.2	22.9	16.8	10.7	15.7	14.0	14.5	27.9	32.4	11.7
2-15	AM	-	19.7	20.6	17.4	22.7	22.2	15.9	20.6	13.5	10.6	12.4	11.5	10.8	23.2	23.7	12.2
3-14	AM	-	19.0	19.5	15.4	20.7	20.2	16.9	18.5	14.0	14.3	17.0	13.9	14.3	21.0	20.9	16.2
3-28	AM	-	18.6	18.5	15.4	20.2	19.7	17.5	18.2	15.6	14.7	16.5	15.9	16.0	20.6	19.9	17.6
4-11	AM		18.4	18.3	16.1	19.8	19.8	17.5	18.1	15.7	15.1	17.0	16.3	17.6	19.8	19.2	16.7
4-25	AM		18.2	18.1	16.9	19.6	19.2	17.6	17.0	15.7	15.4	16.6	16.6	17.0	19.3	18.8	17.8
5-9	AM		18.2	18.1	18.2	19.3	19.0	18.8	17.2	16.9	16.7	17.4	18.1	19.1	19.1	18.9	18.9
5-23	AM		18.1	18.2	20.0	19.2	19.0	20.0	17.9	18.4	18.5	18.8	20.0	21.8	18.8	18.7	21.0
6-6	AM		18.1	18.5	21.5	19.2	19.2	21.1	18.7	19.9	19.6	20.9	21.8	24.7	18.9	18.2	23.4
6-20	AM		18.1	18.5	23.4	19.2	19.5	22.6	19.4	20.4	21.7	22.9	23.5	27.6	18.9	19.5	25.4
7-11	AM		18.2	19.1	24.6	19.5	20.1	24.1	20.2	22.3	22.4	25.0	26.5	28.0	19.2	20.3	26.4
7-25	AM		18.5	19.4	25.6	19.7	20.6	25.1	21.1	23.6	22.6	26.9	27.9	29.2	19.5	20.9	26.2
8-8	AM		18.7	19.9	25.9	19.8	20.9	25.0	21.7	23.3	23.0	27.5	27.6	30.3	19.7	21.4	27.1
8-23	AM		18.9	20.4	26.0	20.2	21.3	25.0	21.9	23.6	23.2	24.9	26.6	29.3	19.8	21.6	27.0
9-7	AM		19.0	20.4	26.6	20.5	21.6	25.5	22.4	24.1	25.5	26.8	27.6	27.9	20.2	22.1	27.5
9-20	AM		-	20.7	-	-	21.9	-	-	24.0	-	-	28.1	-	-	22.4	-
10-11	AM	16.0	19.5	21.3	24.9	20.8	21.9	23.3	22.4	21.7	20.7	26.9	26.0	23.6	20.5	22.5	23.0
10-24	AM		Thermister Connections shorted-out by rainwater.														
11-8	AM	21.0	19.5	20.6	16.7	20.5	21.1	18.5	Shorted Out			25.2	21.5	16.8	20.6	21.1	20.6
11-24	AM	13.0	19.4	20.4	14.3	20.6	20.8	17.2	21.2	-	17.0	22.5	19.2	14.6	20.5	20.5	12.4

PLATE H-1B

THERMISTOR READINGS

DATE	TIME	AIR TEMP.	CELL A Temperature °C			CELL B Temperature °C			CELL C Temperature °C			CELL D Temperature °C			CELL E Temperature °C		
			Bot.	Mid.	Top	Bot.	Mid.	Top	Bot.	Mid.	Top	Bot.	Mid.	Top	Bot.	Mid.	Top
11-30	AM	6.0	19.2	20.0	13.1	20.3	20.3	16.1	20.4	13.0	11.6	21.1	17.8	13.7	20.1	19.8	11.3
12-19	AM	14.0	18.9	19.1	7.8	19.7	19.3	12.3	-	22.7*	14.4	19.3	15.2	8.7	19.3	18.4	5.9
1-10-73	AM	11.0	18.2	17.6	8.0	18.7	17.7	-	17.7	9.5	7.2	13.1	13.0	9.1	18.1	16.6	6.4
1-23-73	AM	5.0	21.2	16.8	10.5	18.2	17.0	11.9	16.3	9.0	8.6	15.8	12.5	11.1	17.1	15.5	9.2
2-6-73	AM	11.5	15.4*	16.4	9.8	17.7	16.4	11.5	16.8	16.7	12.6	14.7	12.3	10.6	16.9	15.2	9.4
2-27-73	AM	13.0	17.1	16.1	11.9	17.3	15.8	12.4	10.3*	10.8*	10.3*	14.2	12.7	12.2	16.6	15.0	11.9
3-13-73	AM	11.5	17.1	16.0	11.9	15.9	15.7	12.7	15.5	11.2	10.6	14.1	15.1	12.3	16.5	15.1	11.6
3-27-73	AM	15.5	16.8	15.7	12.0	16.7	15.5	12.6	14.7	11.4	10.6	12.1	13.2	12.0	16.4	15.1	12.1
4-10-73	AM	21.0	16.7	15.8	14.6	16.6	15.4	13.7	14.1	11.9	12.8	14.1	13.3	13.5	16.5	15.2	15.7
4-24-73	AM	22.0	16.7	15.8	16.6	16.6	15.6	15.3	14.1	13.5	14.9	14.4	14.2	15.0	16.4	15.5	17.4
5-15-73	AM	22.0	16.9	16.6	20.3	16.7	16.1	18.5	15.1	15.9	18.0	15.1	16.4	18.1	16.7	16.3	21.9
6-5-73	AM	20.0	17.6	18.9	24.8	21.6	17.0	21.8	16.1	16.3	21.9	16.4	18.9	24.2	17.2	17.6	26.2
6-26-73	AM	27.0	17.6	18.3	26.8	17.7	18.2	24.4	17.7	21.1	21.8	18.1	21.8	23.8	17.9	19.1	28.3
7-17-73	AM	19.5	18.2	19.6	28.9	18.4	19.5	26.5	18.7	23.0	24.8	20.0	23.8	25.4	18.6	20.3	29.0
8-7-73	AM	16.8	19.1	20.8	29.8	19.4	20.8	27.3	20.1	24.2	24.6	22.8	25.7	24.5	19.7	21.7	30.4
8-29-73	AM	-	19.5	21.7	29.0	20.1	21.6	27.1	20.8	24.6	23.6	24.5	25.8	24.2	20.3	22.5	28.6
9-19-73	AM	21.5	19.9	22.1	28.8	20.5	22.0	26.9	21.1	24.3	22.7	24.6	25.4	23.0	20.7	22.8	27.5
10-9-73	AM	19.5	19.9	21.6	25.2	20.6	21.9	24.8	21.0	23.0	20.2	20.9	23.6	24.2	20.7	22.5	23.0
10-30-73	AM	32.0	19.9	21.9	21.4	20.6	21.6	22.3	20.5	21.0	17.3	22.7	20.6	17.8	20.7	22.0	19.9
11-20-73	AM	-	20.0	21.4	16.5	20.6	21.1	18.5	19.8	18.4	14.5	21.5	19.2	15.7	20.7	21.1	14.2
12-11-73	AM	20.0	19.6	20.2	12.9	20.1	19.8	15.3	18.4	15.7	10.9	20.8	17.1	12.8	20.0	19.6	11.6
1-4-74	AM	10.5	18.8	18.8	11.0	20.2	18.0	13.6	16.6	24.3	10.0	18.2	14.4	11.2	18.7	18.8	9.2
1-22-74	AM	16.5	18.2	17.9	11.2	12.3*	16.8	12.2	15.6	12.5	8.1	8.0*	12.7	10.8	17.9	17.4	10.8
2-13-74	AM	12.5	17.7	17.3	10.6	17.6	16.1	12.2	18.1	11.8	8.9	15.3	11.9	11.1	17.2	17.6	10.4
3-6-74	AM	15.0	17.3	16.6	17.2	17.1	15.5	11.0	17.2	14.6	11.5	13.4	11.9	11.5	16.7	16.6	10.7
3-28-74	AM	16.0	14.0*	16.2	13.2	16.7	15.2	13.4	13.7	12.1	11.7	13.5	12.8	13.2	16.4	16.5	13.6
4-17-74	AM	15.0	16.8	16.3	15.3	16.6	15.3	14.5	14.4	13.1	10.7	15.2	14.1	13.7	16.6	17.1	16.3
5-7-74	AM	27.0	16.8	16.5	17.8	16.7	15.6	16.5	14.7	14.7	15.4	15.0	15.7	16.8	16.5	17.5	19.1
5-28-74	AM	21.0	16.9	16.6	21.8	16.8	16.2	19.6	15.3	17.0	18.6	16.6	18.1	20.0	16.8	17.8	23.4
6-19-74	AM	18.0	17.2	17.6	25.1	17.3	17.4	23.6	16.2	19.9	21.5	19.0	22.5	-	17.5	19.8	25.0

* - Questionable Data

PLATE H-1C

GAS PROBE READINGS(1)

DATE	TIME	CELL A Explosibility-%			CELL B Explosibility-%			CELL C Explosibility-%			CELL D Explosibility-%			CELL E Explosibility-%		
		Bot.	Mid.	Top	Bot.	Mid.	Top	Bot.	Mid.	Top	Bot.	Mid.	Top	Bot.	Mid.	Top
1971																
11-19	AM	0.80	0.67	0.40	0.28	0.18								0.20		
11-22	AM	*	1.00	0.60	0.42	0.40								*		
	PM	1.00	*	0.50	0.50	0.40								*		
11-23	AM	0.98	1.00	0.50	0.54	0.40								-		
	PM	*	1.00	0.50	0.50	0.40								-		
11-24	AM	1.00	*	0.50	0.48	0.40								*		
	PM	*	*	0.58	0.46	0.40								*	0.60	
11-29	AM	*	*	0.68	0.54	0.58								*	0.86	
	PM	-	-	-	0.70	0.60								*	0.88	
11-30	AM	*	*	0.60	0.70	0.60								*	0.88	
	PM	*	*	0.58	0.66	0.92								*	0.92	
12-1	AM	1.00	*	0.56	0.50	1.00								*	0.88	
12-2	AM	1.00	*	0.45	0.60	0.80	0.20							*	0.90	
	PM	1.00	*	0.30	0.60	0.60	0.20							*	0.90	
12-3	AM	1.00	*	0.35	0.60	0.60	0.20							*	0.90	
12-6	AM	1.00	*	0.40	0.58	0.58	-							0.66	-	
	PM	1.00	1.00	0.46	*	0.80	-							0.70	0.70	
12-7	AM	1.00	1.00	0.38	0.64	0.80	-							*	0.84	
12-8	PM	0.80	0.60	0.42	0.60	0.92	-							*	*	
12-9	AM	*	1.00	0.42	0.64	0.92	-							*	*	
12-10	AM	*	*	0.48	*	*	-							*	*	
12-13	PM	*	*	*	*	*	*							*	*	0.80
12-14	AM	*	*	0.50	*	*	*	*	*	0.2				*	*	*
12-15	AM	*	*	0.48	*	*	*	*	*	0.54				*	*	*
12-16	PM	*	*	0.46	*	*	*	*	*	0.66				-	-	-
12-17	PM	-	-	-	-	-	-	*	*	0.74	0.18			-	-	-
12-19	PM	-	-	-	0.28	0.18	-	-	-	-	-			-	-	-
12-20	PM	-	-	-	-	-	-	*	*	0.80	0.22			-	-	-

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(1) Gases collected in the gas probes were tested for concentration in parts per million of combustible toxic vapors present. Concentrations exceeded instrument readout limits of 1000 parts per million and are therefore not included in this table.

* - Indicates a reading exceeding the 0 - 1 range of the explosibility gauge.

PLATE H-2A

GAS PROBE READINGS(1)

DATE	TIME	CELL A Explosibility-%			CELL B Explosibility-%			CELL C Explosibility-%			CELL D Explosibility-%			CELL E Explosibility-%		
1972		Bot.	Mid.	Top	Bot.	Mid.	Top	Bot.	Mid.	Top	Bot.	Mid.	Top	Bot.	Mid.	Top
1-3	PM	*	*	*	*	0.8	-	-	-	-	-	-	-	*	*	*
1-11	AM	3.5	3.6	0.9	-	1.0+	-	5.0	5.2	5.1	6.1	-	4.5	2.0	3.8	0.8
1-18	PM	3.0	3.2	-	0	2.0	-	4.5	-	4.8	-	-	2.0	3.8	4.0	1.0
1-27	PM	*	-	-	*	*	1.0	*	*	*	-	-	*	*	*	- 1.0
2-15	AM	1.0	2.6	0.2	*	7.4	0.3	*	*	*	-	-	0.85	1.4	2.5	1.0
3-2	AM	1.4	1.1	0.13	*	6.0	-	*	0.8	1.5	-	-	1.0	1.8	1.2	0.8
3-14	AM	0.7	1.0	1.3	*	5.5	0.6	0.8	0.8	1.3	-	-	1.6	1.2	2.0	0.5
4-11	AM	0.5	0.8	0.17	*	4.0	0.2	0.75	-	-	-	-	2.0	0.8	1.7	0.5
4-25	AM	*	0.3	*	*	*	*	0.5	-	-	-	-	*	0.75	1.2	0.4
5-9(3)	AM	0	0.01	0.01	0.09	0.04	0	0	-	-	-	-	0.04	0.02	0.03	0
5-23	AM	0.24	0.78	0.06	0	0.01	0.02	0.01	-	-	-	-	0.01	0.01	0.04	0
6-6		-	-	-	-	-	-	-	-	-	-	-	0	0.10	0.32	0
6-20		0.03	0.04	0.06	0.06	0.04	0.02	0.02	-	-	-	-	0.21	0.16	*	0.4
7-11	AM	0.01	0.02	0.01	0.04	0.03	0.01	0.00	-	-	-	-	0.01	0.01	0.03	0.15
7-25	AM	0.14	0.04	0.20	0.07	0.20	0.10	0.00	-	-	-	-	0.04	0.00	0.05	0.23
8-23	AM	-	0.02	-	-	0.33	-	0.02	-	-	-	-	0.02	-	0.06	-
9-7	AM	-	-	-	-	-	-	-	-	-	-	-	0.33	-	-	-
9-20	AM	-	*	-	-	*	-	*	-	-	-	-	*	-	*	-
10-24	AM	-	0.02	-	-	0.26	-	0.04	-	-	0.10	-	-	-	0.05	-
11-21	AM	-	0.02	-	-	0.14	-	0.03	-	-	Probes Blocked			-	0.06	-
12-19	AM	-	0.06	-	-	0.22	-	0.05	-	-	Probes Blocked			-	0.22	-
1973																
1-23	AM	-	0.03	-	-	*	-	0.05	-	-	Probes Blocked			-	0.35	-
2-27	AM	-	0.02	-	-	0.06	-	-	-	0.08	Probes Blocked			-	0.03	-
3-27	AM	-	0.02	-	-	0.48	-	0.06	-	-	Probes Blocked			-	0.46	-
4-24	AM	-	0.01	-	-	0.22	-	0.10	-	-	Probes Blocked			-	0.03	-
6-5	AM	-	0.04	-	-	0.10	-	0.10	-	-	Probes Blocked			-	0.08	-

(1) Gases collected in the gas probes were tested for concentration in parts per million of combustible toxic vapors prevent. Concentrations exceeded instrument readout limits of 1000 parts per million and are therefore not included in this table.

(2) Began readings with dilution valve. Increases explosibility range to 0-10.

* Indicates a reading exceeding the 0-1 range of the explosibility gauge.

(3) Began recording stabilized instead of maximum explosibility.

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PLATE H-2B

LABORATORY GAS ANALYSIS

CELLS A & B

* PROBE NO.	GAS COMPONENTS	DATE										
		12-8-71	1-3-72	1-18-72	1-27-72	2-15-72	3-2-72	3-14-72	4-25-72	5-23-72	6-20-72	7-25-72
A-B	Carbon Dioxide		35.3		54.9		66.7				59.5	
	Oxygen		14.7		5.3		1.7				0.5	
	Nitrogen		50.0		39.8		31.4				40.0	
	Methane		0		0		0.2				Tr	
A-M	Carbon Dioxide	21.8	47.4					67.6	65.9		60.4	58.3
	Oxygen	12.4	9.6					2.6	0.5		0.6	0.6
	Nitrogen	65.8	43.0					29.6	33.6		39.0	41.1
	Methane	0	0					0.2	Tr		Tr	Tr
A-T	Carbon Dioxide		28.7								31.2	
	Oxygen		8.2								2.0	
	Nitrogen		63.1								66.8	
	Methane		0								Tr	
B-B	Carbon Dioxide					74.0				92.4		
	Oxygen					5.3				0.5		
	Nitrogen					20.7				7.1		
	Methane					0				Tr		
B-M	Carbon Dioxide	36.0	61.6	44.1		59.1		89.5	91.1	85.0		75.7
	Oxygen	9.2	8.4	12.0		8.4		2.0	0.8	1.3		1.5
	Nitrogen	54.8	30.0	43.9		32.5		8.5	8.1	13.7		22.8
	Methane	0	0	0		0		0	Tr	Tr		Tr
B-T	Carbon Dioxide					48.8				64.2		
	Oxygen					7.4				0.4		
	Nitrogen					43.8				35.4		
	Methane					0				Tr		

* - First letter indicates cell; second letter indicates bottom, middle or top probe.

PLATE H-3A

LABORATORY GAS ANALYSIS

CELLS A & B

* PROBE NO.	GAS COMPONENTS	DATE										
		8-23-72	9-20-72	10-24-72	11-21-72	12-19-72	1-23-73	2-27-73	3-27-73	6-5-73	7-17-73	10-9-73
A-B	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
A-M	Carbon Dioxide	55.4	54.6	55.8	59.5	61.6	60.7	63.5	63.8	68.2	65.7	
	Oxygen	1.4	0.9	0.7	0.5	0.5	0.6	1.2	0.5	0.4	0.6	
	Nitrogen	43.2	44.5	43.5	40.0	37.7	38.2	34.3	34.7	30.2	33.2	
	Methane	Tr	Tr	Tr	Tr	0.2	0.5	1.0	1.0	1.2	0.5	
A-T	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
B-B	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
B-M	Carbon Dioxide	74.2	74.0	64.8	70.6	70.0		69.8	63.7	67.1		60.2
	Oxygen	1.1	0.5	1.1	0.7	0.9		0.7	0.8	1.0		1.2
	Nitrogen	24.7	25.3	33.9	28.2	28.4		28.3	34.1	29.0		37.7
	Methane	Tr	0.2	0.2	0.5	0.7		1.2	1.4	2.9		0.9
B-T	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											

* - First letter indicates cell; second letter indicates bottom, middle or top probe.

PLATE H-3B

LABORATORY GAS ANALYSIS
CELLS A & B

* PROBE NO.	GAS COMPONENTS	DATE										
		12-11-73	1-22-74	3-6-74	4-17-74	5-28-74						
A-B	Carbon Dioxide	54.5	40.5	72.9	75.6							
	Oxygen	0.3	0.2	0.4	0.5							
	Nitrogen	45.0	59.1	26.2	23.4							
	Methane	0.2	0.2	0.5	0.5							
A-M	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
A-T	Carbon Dioxide					44.3						
	Oxygen					0.8						
	Nitrogen					54.8						
	Methane					0.2						
B-B	Carbon Dioxide					63.8						
	Oxygen					0.3						
	Nitrogen					21.8						
	Methane					14.1						
B-M	Carbon Dioxide	64.9			67.3							
	Oxygen	0.4			0.2							
	Nitrogen	26.7			14.4							
	Methane	8.0			18.1							
B-T	Carbon Dioxide		42.5	63.5		38.3						
	Oxygen		0.4	0.2		0.8						
	Nitrogen		32.8	18.5		58.4						
	Methane		24.3	17.8		2.5						

* - First letter indicates cell; second letter indicates bottom, middle or top probe.

PLATE H-3C

LABORATORY GAS ANALYSIS

CELLS C & D

* PROBE NO.	GAS COMPONENTS	DATE										
		1-11-72	1-18-72	1-27-72	2-15-72	3-2-72	3-14-72	3-28-72	4-25-72	5-23-72	6-20-72	7-25-72
C-B	Carbon Dioxide	54.7		59.0	63.9	67.2			96.6	99.5	98.0	98.4
	Oxygen	8.6		8.3	7.8	6.8			0.5	Tr	0.3	Tr
	Nitrogen	36.7		32.7	28.3	26.0			2.6	0.2	1.4	0.2
	Methane	0		Tr	0	Tr			0.3	0.3	0.3	1.4
C-M	Carbon Dioxide	71.8	51.5		75.7		81.6					
	Oxygen	4.7	10.7		4.9		4.0					
	Nitrogen	23.5	37.8		19.4		14.4					
	Methane	0	Tr		0		Tr					
C-T	Carbon Dioxide	57.5		59.0	68.5	72.3						
	Oxygen	8.1		8.6	6.2	4.7						
	Nitrogen	34.4		32.4	25.3	23.0						
	Methane	0		Tr	0	Tr						
D-B	Carbon Dioxide	52.5										
	Oxygen	9.5										
	Nitrogen	38.0										
	Methane	0										
D-M	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
D-T	Carbon Dioxide	61.4		77.3	89.5	94.9		97.7	97.1		98.3	88.0
	Oxygen	7.3		4.2	1.9	0.3		0.1	0.1		Tr	0.1
	Nitrogen	31.3		18.5	8.6	4.8		2.2	2.8		1.7	3.2
	Methane	0		Tr	0	0		0	Tr		Tr	8.7

* - First letter indicates cell; second letter indicates bottom, middle or top probe.

PLATE H-4A

LABORATORY GAS ANALYSIS

CELLS C & D

* PROBE NO.	GAS COMPONENTS	DATE										
		8-23-72	9-11-72	10-11-72	10-24-72	11-21-72	12-19-73	1-23-73	2-27-73	3-27-73	6-5-73	7-17-73
C-B	Carbon Dioxide	95.4		90.8	89.9	87.5	82.6	76.9	75.6	75.0	77.0	77.0
	Oxygen	Tr		Tr	Tr	Tr	0.1	Tr	0.1	Tr	Tr	0.4
	Nitrogen	0.3		0.1	0.3	0.4	0.6	0.3	0.4	0.3	0.4	1.8
	Methane	4.3		9.1	9.8	12.1	16.7	22.8	23.9	24.7	22.6	20.8
C-M	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
C-T	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
D-B	Carbon Dioxide				59.7							
	Oxygen				0.1							
	Nitrogen				0.7							
	Methane				39.5							
D-M	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
D-T	Carbon Dioxide	58.4	48.5									
	Oxygen	Tr	0.4									
	Nitrogen	1.2	1.3									
	Methane	40.4	49.8									

* - First letter indicates cell; second letter indicates bottom, middle or top probe.

PLATE H-4B

LABORATORY GAS ANALYSIS

CELLS C & D

* PROBE NO.	GAS COMPONENTS	DATE										
		10-9-73	12-11-73	2-13-74	3-6-74	3-28-74	4-17-74	5-28-74				
C-B	Carbon Dioxide	75.0	52.7	55.0		54.5	52.9	43.1				
	Oxygen	Tr	Tr	Tr		Tr	0.1	4.9				
	Nitrogen	0.2	0.4	0.1		0.1	0.3	14.5				
	Methane	24.8	46.9	44.9		45.4	46.7	37.5				
C-M	Carbon Dioxide							46.2				
	Oxygen							0.1				
	Nitrogen							0.4				
	Methane							53.3				
C-T	Carbon Dioxide							29.2				
	Oxygen							1.1				
	Nitrogen							4.8				
	Methane							64.9				
D-B	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
D-M	Carbon Dioxide		21.5									
	Oxygen		0.4									
	Nitrogen		27.3									
	Methane		50.8									
D-T	Carbon Dioxide	22.7**		40.8**	41.4			32.8				
	Oxygen	0.6		0.2	Tr			4.5				
	Nitrogen	44.1		10.5	0.1			13.0				
	Methane	32.6		48.5	58.5			49.7				

* - First letter indicates cell; second letter indicates bottom, middle or top probe.

** - Surface probe installed as of 9-18-73 due to blockage of in-cell probes.

PLATE H-4C

LABORATORY GAS ANALYSIS
CELL E

* PROBE NO.	GAS COMPONENTS	DATE										
		12-8-71	1-3-72	1-18-72	2-15-72	3-2-72	3-14-72	4-25-72	6-20-72	7-25-72	8-28-72	9-20-72
E-B	Carbon Dioxide		40.7	54.4		61.7			77.5			
	Oxygen		10.0	8.8		6.3			0.9			
	Nitrogen		45.0	31.8		25.2			14.4			
	Methane		4.3	5.0		6.8			7.2			
E-M	Carbon Dioxide		39.0	57.8	52.1		80.6	80.6	67.6	69.8	72.0	70.3
	Oxygen		13.3	8.5	7.7		1.0	0.3	2.8	1.6	0.2	0.6
	Nitrogen		46.4	30.7	37.3		13.6	13.8	24.8	23.1	21.7	23.6
	Methane		1.3	3.0	2.9		4.8	5.3	4.8	5.5	6.1	5.5
E-T	Carbon Dioxide		50.8	51.7		46.6			41.0			
	Oxygen		8.5	4.0		3.5			0.9			
	Nitrogen		40.0	42.9		48.4			56.8			
	Methane		0.7	1.4		1.5			1.3			
	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											

* - First letter indicates cell; second letter indicates bottom, middle or top probe.

PLATE H-5A

LABORATORY GAS ANALYSIS
CELL E

* PROBE NO.	GAS COMPONENTS	DATE										
		10-24-72	11-21-72	12-19-72	2-27-73	3-27-73	4-24-73	6-5-73	7-17-73	10-9-73	12-11-73	4-17-74
E-B	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
E-M	Carbon Dioxide	64.2	74.1	83.5	90.5	88.2	87.1	85.4	83.9	77.4	80.4	
	Oxygen	0.4	0.2	0.3	0.1	0.1	0.1	0.3	0.3	0.2	1.4	
	Nitrogen	29.6	20.6	10.9	4.9	6.5	6.6	7.9	10.0	14.8	11.9	
	Methane	5.6	5.1	5.3	4.5	5.2	6.2	6.4	5.8	7.6	6.3	
E-T	Carbon Dioxide											53.7
	Oxygen											1.0
	Nitrogen											42.6
	Methane											2.7
	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											

* - First letter indicates cell; second letter indicates bottom, middle or top probe.

PLATE H-5B

LEACHATE ANALYSIS
CELL A

COMPONENT *	SAMPLE DATE 12-15-71	12-21-71	1-3-72	2-15-72	9-7-72
Alkalinity ($CaCO_3$)				240	1300
B.O.D.					2250
Cadmium					0
Calcium				44	20
C.O.D.				16200	3260
Chloride				56	56
Color (Color Units)				28	30
Copper				< 0.2	< 0.08
Dissolved Oxygen ppm		1.4		1.6	4.6
Elect. Cond. μ mhos/cm		285		500	1000
Fecal Coli. MPN/100 ml					< 3
Fecal Strep. MPN/100 ml					< 3
Iron					
Lead				< 0.5	0.16
Magnesium				2.6	17
Mercury				0.0006	0.0034
Nitrogen - Ammonia				4.5	0
Nitrogen - Organic				15.6	3
Nitrogen - Nitrate				0.0	0
Phosphate-Total, as P				2.0	0
P.C.B. ppb					
Potassium				4.8	6.6
Sodium				80	128
Solids - T.D.S.				724	724
Solids - T.S.S.				60	70
Solids - Settle. ml/l					< 0.1
Sulphate				28	20
Temperature** (°C)				17.0	28.5
Volatile Acids				48	430
Zinc				2.1	0.23
pH	5.1	4.8	4.7	5.0	5.0

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 Plate H-6A

LEACHATE ANALYSIS
CELL A

COMPONENT *	SAMPLE DATE 10-11-72	11-21-72	11-30-72	1-10-73	2-27-73
Alkalinity	1370	2160		3920	2310
B.O.D.	2850	16,200		19,200	12,700
Cadmium	0	<0.03		<0.1	<0.05
Calcium	48	938		1082	440
C.O.D.	3630	22,440		20,300	17,600
Chloride	58	390		490	424
Color (Color Units)	28	350		125	75
Copper	0.16	0.15		0.44	0.06
Dissolved Oxygen ppm	1.4	0.1	0.4	0.8	0.4
Elect. Cond. μ mhos/cm	800	5250	7000	7250	5000
Fecal Coli. MPN/100 ml	<3	< 3		<3	
Fecal Strep. MPN/100 ml	<3	9.4		<3	
Iron	22.5	750		1050	945
Lead	0.12	0.44		0.55	1.29
Magnesium	18	590		760	608
Mercury	0.0078	0.0124		0.0096	0.0205
Nitrogen - Ammonia	3	81		48	66
Nitrogen - Organic	14	89		42	29
Nitrogen - Nitrate	0.10	0.0		0.90	0.40
Phosphate-Total, as P	<0.1	1.4		2.8	1.4
P.C.B. ppb			0		
Potassium	6.1	130		148	120
Sodium	161	300		338	288
Solids - T.D.S.	820	11,800		14,080	10,700
Solids - T.S.S.	42	200		98	14
Solids - Settle. ml/l					
Sulphate			250		
Temperature** (°C)	16.0	10.0	7.0	10.0	12.0
Volatile Acids		10,000		12,700	9400
Zinc	0.58	9.0		5.5	3.2
pH	4.7	4.7	4.8	4.8	5.4

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 Plate H-6B

LEACHATE ANALYSIS
CELL A

COMPONENT *	SAMPLE DATE 3-13-73	3-27-73	4-10-73	11-20-73	12-13-73
Alkalinity			2835	3600	12,650
B.O.D.			17,500	25,600	32,000
Cadmium			< 0.05	<0.05	<0.05
Calcium			858	1603	2,369
C.O.D.			18,300	36,640	55,150
Chloride			440	1210	2,148
Color (Color Units)			450		
Copper			0.22	0.60	0.27
Dissolved Oxygen ppm			0.6	0.6	1.2
Elect. Cond. µ mhos/cm			4750	9500	7,800
Fecal Coli. MPN/100 ml					< 3
Fecal Strep. MPN/100 ml					< 3
Iron			850	615	960
Lead			1.81	0.86	1.0
Magnesium			548	630	1,060
Mercury			0.0014	0.0092	0
Nitrogen - Ammonia			55	328	371
Nitrogen - Organic			17	244	377
Nitrogen - Nitrate				<0.1	0
Phosphate-Total, as P			1.6	16	10
P.C.B. ppb	0				
Potassium			115	650	700
Sodium			272		900
Solids - T.D.S.			11,020	22,880	26,740
Solids - T.S.S.			16		
Solids - Settle. ml/l					
Sulphate	108				916
Temperature** (°C)			20.0	13.5	12.0
Volatile Acids			9900	13,500	18,780
Zinc			3.0	78	64
pH			4.9	5.1	5.2

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-6C

Project 102-1.3

LEACHATE ANALYSIS
CELL A

COMPONENT *	SAMPLE DATE 1-22-74	3-6-74	4-17-74	6-19-74	
Alkalinity	8,272	6,696	4,650	3,162	
B.O.D.	28,600	31,000	32,950	25,000	
Cadmium	0.072	0.044	0.057	0.046	
Calcium	2,249	1,883	2,044	2,244	
C.O.D.	44,968	21,050	49,560	44,122	
Chloride	1,225	1,176	1,174	1,125	
Color (Color Units)					
Copper	0.46	1.08	0.668	0.38	
Dissolved Oxygen ppm	0.8	1.2	1.0	0.9	
Elect. Cond. µ mhos/cm	3,100	13,000	13,000	15,000	
Fecal Coli. MPN/100 ml				< 30	
Fecal Strep. MPN/100 ml				< 30	
Iron	648	610	600	748	
Lead	0.33	0.27	0.408	0.63	
Magnesium	750	750	775	853	
Mercury	0.045	<0.001	0.021	0.0044	
Nitrogen - Ammonia	520	325	415		
Nitrogen - Organic	271	137	229	503	
Nitrogen - Nitrate	0.3	0.06	0.80	0.19	
Phosphate-Total, as P	16	4	3	13	
P.C.B. ppb	0			ND	
Potassium	916	620	812	646	
Sodium	895	730	792	683	
Solids - T.D.S.	22,172	19,740	21,632	22,270	
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate					
Temperature** (°C)	17.5	12.5	15.0	20.0	
Volatile Acids	16,260	16,620	17,940	18,840	
Zinc	57	32	60	50	
pH	5.0	5.1	5.1	5.3	
Total Sulphides				0	

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-6D

Project 102-1.3

LEACHATE ANALYSIS
CELL B

COMPONENT *	SAMPLE DATE				
	12-7-71	12-10-71	12-15-71	12-21-71	12-28-71
Alkalinity ($CaCO_3$)	0	0			972
B.O.D.	13,500	15,300			32,400
Cadmium					
Calcium	320	200			1,681
C.O.D.	15,933	17,920			42,600
Chloride	1,475	998			1,800
Color (Color Units)	1,600	2,000			2,500
Copper					
Dissolved Oxygen ppm	1.4	< 0.5		1.1	0.8
Elect. Cond. μ mhos/cm				14,500	12,000
Fecal Coli. MPN/100 ml	>24,000	9.3×10^5			300
Fecal Strep. MPN/100 ml	>2,400	2.1×10^7			1.5×10^5
Iron					
Lead					
Magnesium	320	550			924
Mercury					
Nitrogen - Ammonia					0.25
Nitrogen - Organic					170
Nitrogen - Nitrate	66	58			2.5
Phosphate-Total, as P	0.029	0.084			0
P.C.B. ppb		0			0
Potassium					
Sodium					
Solids - T.D.S.	15,970	25,028			29,663
Solids - T.S.S.	421	496			148
Solids - Settle. ml/l					< 0.1
Sulphate					
Temperature** (°C)					
Volatile Acids					6,360
Zinc					
pH	4.4	4.2	4.5	4.3	4.2

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-7A

LEACHATE ANALYSIS
CELL B

COMPONENT *	SAMPLE DATE				
	1-3-72	1-7-72	10-24-72	11-30-72	1-23-73
Alkalinity	2360		6880		5880
B.O.D.	28,350		45,000		40,000
Cadmium	<0.25		0.19		< 0.1
Calcium	2950		1640		1323
C.O.D.	41,000		58,450	61,700	51,400
Chloride	1725		2000		498
Color (Color Units)			950		650
Copper	3.6		0.29		0.20
Dissolved Oxygen ppm	2.4	7.4	0.5	0.2	0.3
Elect. Cond. μ mhos/cm		14,000	20,000	10,000	9500
Fecal Coli. MPN/100 ml	< 3.0		6.0	< 3.0	<3.0
Fecal Strep. MPN/100 ml	2.1×10^4		2400	230	360
Iron			408		425
Lead	3.0		0.95		0.35
Magnesium	815		816		344
Mercury	0.006		0.0056		0.0176
Nitrogen - Ammonia	226		780		560
Nitrogen - Organic	20		570		388
Nitrogen - Nitrate	14		0.4	0	0
Phosphate-Total, as P	83		5.0		0.8
P.C.B. ppb			0		
Potassium	1500		1560		1180
Sodium	1325		1550		1072
Solids - T.D.S.	42,270		29,000		24,520
Solids - T.S.S.	368		1800		124
Solids - Settle. ml/l	<0.1				
Sulphate			980	1070	
Temperature** (°C)	14.0	12.5	19.0	6.0	9.0
Volatile Acids	10,800		17,500		14,400
Zinc	140		62		24
pH	4.2	4.4	5.0	5.3	5.4

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-7B

LEACHATE ANALYSIS
CELL B

COMPONENT *	SAMPLE DATE 3-13-73	11-20-73	12-13-73	1-22-74	3-6-74
Alkalinity	4725	4700	14,280	9,306	7,626
B.O.D.	22,800	47,500	49,500	45,000	36,000
Cadmium	< 0.05	0.09	0.08	0.073	0.049
Calcium	1130	2164	2289	2,249	1,322
C.O.D.	32,200	62,660	74,600	63,656	46,782
Chloride	1320	1438	3846	2,243	1,959
Color (Color Units)	275				
Copper	0.18	0.14	0.15	0.18	0.205
Dissolved Oxygen ppm	0.8	0.1	1.5	1.8	1.2
Elect. Cond. μ mhos/cm	4500	12,500	8000	3,400	14,500
Fecal Coli. MPN/100 ml	< 3.0		3.0		
Fecal Strep. MPN/100 ml	93.0		6.2		
Iron	348	500	500	516	415
Lead	0.33	0.86	1.0	0.45	0.27
Magnesium	378	840	890	830	645
Mercury	.0044	0	0	0.075	<0.001
Nitrogen - Ammonia	480	753	925	917	705
Nitrogen - Organic	250	521	774	545	304
Nitrogen - Nitrate	0.1	< 0.1	0.24	0.2	0.16
Phosphate-Total, as P	4.2	24	22	24	10
P.C.B. ppb	0			0	
Potassium	940	1550	1700	1,394	1,140
Sodium	816		1710	1,530	520
Solids - T.D.S.	17,480	33,440	34,000	30,204	21,620
Solids - T.S.S.	36				
Solids - Settle. ml/l	-				
Sulphate	1036		1315		
Temperature ** (°C)	13.0	17.0	15.5	16.0	14.5
Volatile Acids	10,100	18,420	18,060	15,960	14,940
Zinc	10.8	73	73	61	80
pH	5.2	5.4	5.6	5.2	5.4

* Units in mg/l unless noted.
** Temperatu : of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-7C

LEACHATE ANALYSIS
CELL B

COMPONENT *	SAMPLE DATE 4-17-74				
Alkalinity	6,789				
B.O.D.	46,000				
Cadmium	0.065				
Calcium	2,084				
C.O.D.	35,600				
Chloride	2,446				
Color (Color Units)					
Copper	0.116				
Dissolved Oxygen ppm	1.4				
Elect. Cond. μ mhos/cm	19,000				
Fecal Coli. MPN/100 ml					
Fecal Strep. MPN/100 ml					
Iron	460				
Lead	0.488				
Magnesium	815				
Mercury	0.016				
Nitrogen - Ammonia	871				
Nitrogen - Organic	441				
Nitrogen - Nitrate	0.26				
Phosphate-Total, as P	8				
P.C.B. ppb					
Potassium	1,417				
Sodium	1,417				
Solids - T.D.S.	28,104				
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate	1,580				
Temperature ** (°C)	15.0				
Volatile Acids	18,120				
Zinc	63				
pH	5.4				

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-7D

LEACHATE ANALYSIS

CELL C

	SAMPLE DATE				
COMPONENT *	12-15-71	12-21-71	12-28-71	1-3-72	1-7-72
Temperature** (°C)				11.0	11.0
Alkalinity ($CaCO_3$)			0	4900	
B.O.D.			15,900	22,500	
Cadmium				< 0.25	
Calcium			1041	1700	
C.O.D.			27,300	26,750	
Color (Color Units)			750		
Copper				2.15	
Chloride			1300	1225	
Dissolved Oxygen ppm		1.4	0.8	1.0	0.5
Elect.Cond. μ mhos/cm		11,200	9500		11,400
Fecal Coli. MPN/100 ml			230,000	4	
Fecal Strep.MPN/100 ml			4,300,000	15,000	
Lead				< 2.0	
Magnesium			1070	725	
Mercury				0.0012	
Nitrogen - Ammonia			0.33	304	
Nitrogen - Organic			310	186	
Nitrogen - Nitrate			4.3	4.25	
Nitrogen - Nitrite					
Phosphate-Total, as P			0.38	3.26	
P.C.B. ppb			0***		
Potassium				445	
Sodium				820	
Solids - T.D.S.			15,400	16,890	
Solids - T.S.S.			323	260	
Solids - Settle. ml/l			<0.1	<0.1	
Volatile Acids				11,520	
Zinc				28	
pH	4.3	4.7	5.1	5.1	5.4
Sulphate					

* Units in mg/l unless noted ***Detected .06 ppb Lindane.
**Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 Plate H-8A

LEACHATE ANALYSIS

CELL C

	SAMPLE DATE				
COMPONENT *	1-18-72	2-15-72	3-2-72	3-14-72	3-28-72
Temperature** (°C)	8.5	19.0	16.5	21.0	18.0
Alkalinity (CaCO$_3$)	5480	5240	4450	4940	4750
B.O.D.	24,600	26,400	27,000	26,200	22,950
Cadmium			< 0.1		
Calcium	1200	1200	1600	1100	1000
C.O.D.	33,500	39,400	32,620	30,500	30,100
Color (Color Units)	700	750	700	500	820
Copper			0.6		
Chloride	1200	1120	1100	1060	1010
Dissolved Oxygen ppm	1.7	0.5	1.0	0.3	0.6
Elect.Cond. μ mhos/cm	11,000	11,000	10,000	12,500	10,000
Fecal Coli. MPN/100 ml	3			3	< 3
Fecal Strep.MPN/100 ml	400			43,000	150,000
Lead			< 0.5		
Magnesium	760	500	550	410	450
Mercury			0.0014		
Nitrogen - Ammonia	240	550	800	570	650
Nitrogen - Organic	174	432	400	280	296
Nitrogen - Nitrate	3.24	3.8	3.10	4.2	4.0
Nitrogen - Nitrite	0.030				
Phosphate-Total, as P	9.8	34.0	41.7	36	34.0
P.C.B. ppb			0.35		0.40
Potassium			845		
Sodium			950		
Solids - T.D.S.	15,190	19,336	18,444	18,025	16,288
Solids - T.S.S.	128	182	88	325	144
Solids - Settle. ml/l	<0.1			<0.1	0.8
Volatile Acids			10,100	9400	9100
Zinc			42		
pH	5.1	5.1	5.1	5.1	5.1
Sulphate		880		820	

* Units in mg/l unless noted
**Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 Plate H-8B

LEACHATE ANALYSIS

CELL C

	SAMPLE DATE				
COMPONENT *	4-11-72	4-25-72	5-9-72	5-23-72	6-6-72
Alkalinity ($CaCO_3$)	4,050	3,750	4,350	4,100	3,600
B.O.D.	20,400	17,400	21,300	23,700	18,000
Cadmium	<0.1		<0.1		0.1
Calcium	1,200	1,000	980	880	1,050
C.O.D.	27,948	24,300	26,680	24,600	20,276
Chloride	880	860	810	740	570
Color (Color Units)	1,700	800	560	400	350
Copper	<0.25		<0.2		0.15
Dissolved Oxygen ppm	0.9	0.4	0.4	0.4	0.2
Elect. Cond. µ mhos/cm	9,000	9,500	11,000	9,750	10,000
Fecal Coli. MPN/100 ml	4	<3	<3	6	92
Fecal Strep. MPN/100 ml	7,500,000	9,300,000	230,000	43,000	1,600,000
Iron					
Lead	<1.0		<1.0		0.8
Magnesium	450	450	400	220	220
Mercury	0.0016		0.015		0.0102
Nitrogen - Ammonia	383	470	592	656	632
Nitrogen - Organic	297	328	312	240	800
Nitrogen - Nitrate	2.94	4.22	2.40	3.6	1.8
Phosphate-Total, as P	9.9	29.1	40.6	41.9	40.3
P.C.B. ppb		0		0	
Potassium	837		750		560
Sodium	700		800		550
Solids - T.D.S.	13,358	11,960	11,980	12,330	10,080
Solids - T.S.S.	220	96	356	84	58
Solids - Settle. ml/l	0.1	0.2	<0.1	0.5	0.6
Sulphate	448		448		340
Temperature** (°C)	17.5	21.0	19.5	19.0	20.0
Volatile Acids	8,460	8,560	9,700	8,720	7,730
Zinc	30		30		22
pH		5.2	5.1	5.1	4.9

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-8C

LEACHATE ANALYSIS

CELL C

	SAMPLE DATE				
COMPONENT *	6-20-72	7-11-72	7-25-72	8-8-72	8-23-72
Alkalinity	2600	4400	3800	2800	2600
B.O.D.	14,700	17,960	10,100	13,600	10,540
Cadmium		<0.1	<0.1	<0.05	
Calcium	700	720	600	630	610
C.O.D.	20,720	23,490	16,630	17,910	17,170
Chloride	530	480	410	430	420
Color (Color Units)	350				150
Copper		0.15	0.18	0.13	
Dissolved Oxygen ppm	0.8	0.7	0.0	0.4	0.4
Elect. Cond. µ mhos/cm	8000	7500	7200	7300	7000
Fecal Coli. MPN/100 ml				<3	
Fecal Strep. MPN/100 ml				3	
Iron		140	120	130	
Lead		<0.10	0.10	0.20	
Magnesium	200	220	192	255	194
Mercury		0.0065		0.018	
Nitrogen - Ammonia	416	351	303	341	338
Nitrogen - Organic	504	90	69	89	79
Nitrogen - Nitrate	4.60	0.04	0.05	0.04	
Phosphate-Total, as P	36.3	24.0	16.4	23.0	26.0
P.C.B. ppb					
Potassium		480	380	460	
Sodium		476	468	380	
Solids - T.D.S.	9180	9324	7470	7642	7268
Solids - T.S.S.	48	52	69	206	178
Solids - Settle. ml/l					
Sulphate					
Temperature** (°C)	19.0	22.0	21.5	20.5	22.0
Volatile Acids		7270		5910	
Zinc		13	10	9.5	
pH	5.0	5.1	5.0	5.2	5.0

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-8D

LEACHATE ANALYSIS

CELL C

COMPONENT *	SAMPLE DATE 9-7-72	9-20-72	10-11-72	10-24-72	11-8-72
Alkalinity	3400	3100	1860	2160	1370
B.O.D.	10,000	9200	9900	10,350	13,000
Cadmium	<0.05		<0.05	0.05	0.06
Calcium	570	570	440	600	560
C.O.D.	16,320	15,130	13,430	16,780	15,660
Chloride	323	540	380	370	650
Color (Color Units)	275	225	175	240	150
Copper	0.07		0.08	0.06	0.11
Dissolved Oxygen ppm	0.2	1.2	0.0	0.4	0.2
Elect. Cond. μ mhos/cm	6000	6100	5600	7200	5000
Fecal Coli. MPN/100 ml	6		3		<3
Fecal Strep. MPN/100 ml	<3		9.3		4.0
Iron	115		150	154	170
Lead	0.22		0.15	0.35	0.15
Magnesium	158	148	154	180	166
Mercury	0.0068		0.005		0.0034
Nitrogen - Ammonia	306	282	283	330	294
Nitrogen - Organic	68	64	71	150	67
Nitrogen - Nitrate	0.5	0.5	0.2	0.4	0.10
Phosphate-Total, as P	17.0	18.0	16.4	12.0	13.0
P.C.B. ppb	0				
Potassium	340		260	360	340
Sodium	312		336	568	340
Solids - T.D.S.	6800	7160	6630	7950	6860
Solids - T.S.S.	88	78	120	50	320
Solids - Settle. ml/l	<0.1				
Sulphate	131				
Temperature** (^{o}C)	21.5	22.5	18.0	22.0	20.0
Volatile Acids	6060		5280	6240	5940
Zinc	7.5		6.5	7.5	8.5
pH	5.0	4.9	4.9	4.8	4.9

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 Plate H-8E

LEACHATE ANALYSIS

CELL C

COMPONENT *	SAMPLE DATE 11-21-72	11-30-72	12-19-72	1-10-73	1-23-73
Alkalinity	1760	1760	1940	1960	1568
B.O.D.	11,800	11,100	14,550	10,800	10,600
Cadmium	0.04	0.05	<0.1	<0.1	<0.1
Calcium	561	520	601	553	480
C.O.D.	16,320	13,900	16,510	13,300	13,000
Chloride	310	284	558	290	220
Color (Color Units)	225	175	175	125	75
Copper	0.10	0.07	0.10	0.05	0.05
Dissolved Oxygen ppm	0.2	0.2	0.2	0.3	0.4
Elect. Cond. μ mhos/cm	4500	6000	5600	5500	4200
Fecal Coli. MPN/100 ml		4		6.1	
Fecal Strep. MPN/100 ml		3		<3	
Iron	160	163		148	185
Lead	0.17	0		0.19	0.20
Magnesium	320	146		118	240
Mercury		0.0046		0.0103	0.0173
Nitrogen - Ammonia	301	265	281	224	242
Nitrogen - Organic	63	60	51	39	60
Nitrogen - Nitrate	0	0.17	0.10	0.26	0.34
Phosphate-Total, as P	2.4	3.2	2.2	1.6	2.4
P.C.B. ppb		0			
Potassium	270	270	320	206	223
Sodium	330	320	336	250	304
Solids - T.D.S.	6500	6160	7040	6260	5180
Solids - T.S.S.	900	132	16	72	34
Solids - Settle. ml/l		0			
Sulphate		114			
Temperature** (^{o}C)	18.0	15.0	15.0	15.0	14.0
Volatile Acids	5700	5520		5500	
Zinc	8.0	3.3	8.5	5.0	6.0
pH	5.2	4.9	5.0	4.9	5.1

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 Plate H-8F

LEACHATE ANALYSIS
CELL C

	SAMPLE DATE				
COMPONENT *	2-6-73	2-27-73	3-13-73	3-27-73	4-10-73
Alkalinity	1890	1470	1575	1575	1575
B.O.D.	10,500	9600	7300	9400	9000
Cadmium	<0.1	<0.05	<0.05	<0.05	<0.05
Calcium	480	545	457	425	480
C.O.D.	12,200	12,900	10,700	10,100	11,200
Chloride	526	405	195	293	205
Color (Color Units)	100	100	75	100	75
Copper	0.06	0.06	0.05	0.06	0.08
Dissolved Oxygen ppm	0.6***	0.6***	0.4	0.4	0.3
Elect. Cond. µ mhos/cm	2900	3300	3625	2200	1500
Fecal Coli. MPN/100 ml	<3.0		3.0		
Fecal Strep. MPN/100 ml	<3.0		<3.0		
Iron	176	278	165	173	195
Lead	<0.1	<0.1	0.1		<0.1
Magnesium	116	141	96	104	108
Mercury	0.0076	0.0209	0.0071		0.0038
Nitrogen - Ammonia	218	215	180	176	185
Nitrogen - Organic	42	54	36	36	19
Nitrogen - Nitrate	0.34	0.40	0.30	0.32	
Phosphate-Total, as P	3.6	4.2	3.0	4.0	2.2
P.C.B. ppb			0		
Potassium	218	200	163	165	190
Sodium	260	272	228	236	252
Solids - T.D.S.	5260	5400	4600	4540	4960
Solids - T.S.S.	4	26	56	34	20
Solids - Settle. ml/l			-		
Sulphate			118		
Temperature** (°C)	15.0	14.0	15.5	16.5	20.0
Volatile Acids	5040		4200		4500
Zinc	4.6	4.5	4.3	2.8	3.5
pH	4.8	5.2	4.7	4.9	5.0

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.
*** Questionable Result

Project 102-1.3 Plate H-8G

LEACHATE ANALYSIS
CELL C

	SAMPLE DATE				
COMPONENT *	4-24-73	5-15-73	6-5-73	6-26-73	7-17-73
Alkalinity	1365	1260	1470	1575	1470
B.O.D.	9100	6300	6800	8200	9100
Cadmium	<0.05	<0.05	0	<0.05	<0.05
Calcium	400	385	417	360	321
C.O.D.	10,800	9490	9860	9600	9300
Chloride	303	254	340	166	164
Color (Color Units)	75				
Copper	0.05	0.04	0.05	0.02	0.05
Dissolved Oxygen ppm	0.7	0.6	0.2	0.5	0.3
Elect. Cond. µ mhos/cm	1950	1900	2400	2050	1750
Fecal Coli. MPN/100 ml				26.0	
Fecal Strep. MPN/100 ml				<3.0	
Iron	220	175	220	218	225
Lead	<0.1	0	0	Tr.	<0.1
Magnesium	98	88	90	86	93
Mercury	0.0084	0.0048		0.0002	
Nitrogen - Ammonia	179	179	196	173	136
Nitrogen - Organic	28	31	26	22	26
Nitrogen - Nitrate	0.24	0.68	0	0.56	0.96
Phosphate-Total, as P	12.0	0.8	4.8	1.4	3.0
P.C.B. ppb					0
Potassium	158	128		123	98
Sodium	228	256		226	244
Solids - T.D.S.	4800	4120	4400	4960	4152
Solids - T.S.S.	4	28			-
Solids - Settle. ml/l					
Sulphate		56		63	-
Temperature** (°C)	19.0	21.0	18.5	25.0	20.5
Volatile Acids		3900		4380	
Zinc	3.8	2.5	1.8	0.6	0.72
pH	5.0	5.1	5.0	5.1	5.5

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 Plate H-8H

LEACHATE ANALYSIS
CELL C

COMPONENT *	SAMPLE DATE 8-7-73	8-29-73	9-18-73	10-9-73	10-30-73
Alkalinity	1200	1300	1400	1700	1400
B.O.D.	6900	8300	8300	7100	7000
Cadmium	<0.05		< 0.05	<0.05	< 0.05
Calcium	353	345	401	360	400
C.O.D.	8574	9500	9700	8390	9210
Chloride	106	154	125	125	130
Color (Color Units)					
Copper	0.04		0.11	0.23	0.15
Dissolved Oxygen ppm	0.70	0.70	-	1.30	0.6
Elect. Cond. µ mhos/cm	2800	2200	2100	1800	2700
Fecal Coli. MPN/100 ml	-				
Fecal Strep. MPN/100 ml	-		-		
Iron	265		275	270	260
Lead	0		0.20	0	<0.2
Magnesium	80	90	76	80	82
Mercury	0				0
Nitrogen - Ammonia	159	173	168	159	126
Nitrogen - Organic	26	28	31	26	17
Nitrogen - Nitrate	.80	0.8	0.56	0.56	3.2
Phosphate-Total, as P	3	9.2	18	6.0	8.0
P.C.B. ppb					
Potassium	110		110		78
Sodium	220		166.		180
Solids - T.D.S.	4520	4600	3268	3600	3750
Solids - T.S.S.					
Solids - Settle. ml/l			0.05		
Sulphate			72		
Temperature ** (°C)	18.5	25.0	22.0	24.0	24.9
Volatile Acids	4200				3900
Zinc	0.8		0.7		0.6
pH	5.1	6.3	4.6	5.0	5.1

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 Plate H-81

LEACHATE ANALYSIS
CELL C

COMPONENT *	SAMPLE DATE 11-20-73	12-11-73	1-4-74	1-22-74	2-12-74
Alkalinity	1500	2652	2,754	1,880	2,452
B.O.D.	7900	5850	4,100	6,400	5,000
Cadmium	< 0.05	0		0.01	
Calcium	400	321	402	442	289
C.O.D.	10,270	7880	8,468	9,068	7,286
Chloride	464	1396	590	805	1,954
Color (Color Units)					
Copper	0.18	0.08		0.04	
Dissolved Oxygen ppm	0.6	0.4		0.8	1.4
Elect. Cond. µ mhos/cm	2,200	1500	2,000	1,100	2,200
Fecal Coli. MPN/100 ml		16			
Fecal Strep. MPN/100 ml		< 3.0			
Iron	250	235		232	
Lead	0.24	0		0.07	
Magnesium	110	70	82	86	81
Mercury	0	0		0.01	
Nitrogen - Ammonia	162	129	143	129	100
Nitrogen - Organic	20	22	31	18	21
Nitrogen - Nitrate	0.2	0.16	<0.1	0.2	0.2
Phosphate-Total, as P	18	14	10	8	7.2
P.C.B. ppb			0		
Potassium	143	225		116	
Sodium		184		164	
Solids - T.D.S.	4760	3604	3,816	3,252	3,108
Solids - T.S.S.					
Solids - Settle. ml/l		2.5			
Sulphate		132			
Temperature ** (°C)	16.5	18.0	18.0	18.0	12.5
Volatile Acids	4260	3060		2,880	
Zinc	1.8	0.6		1.7	
pH	5.3	5.1	5.6	5.1	5.2
Total Sulphides					0.02

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 Plate H-8J

LEACHATE ANALYSIS
CELL C

	SAMPLE DATE				
COMPONENT *	3-6-74	3-28-74	4-17-74	5-7-74	5-28-74
Alkalinity	1,488	3,813	1,302	1,116	651
B.O.D.	8,300	6,950	4,650	5,133	8,000
Cadmium	.013		- 0.006		
Calcium	241	280	320	281	216
C.O.D.	6,423	4,020	7,992	3,643	6,797
Chloride	196	196	782	1,271	204
Color (Color Units)					
Copper	0.10		0.036		
Dissolved Oxygen ppm	1.8	1.0	0.9	1.2	1.2
Elect. Cond. μ mhos/cm	3,000	3,400	3,400	3,200	2,700
Fecal Coli. MPN/100 ml					
Fecal Strep. MPN/100 ml					
Iron	270		250		
Lead	< .01		0.096		
Magnesium	110	175	81.5	80	71.5
Mercury	< .001		0.006		
Nitrogen - Ammonia	77	91	81	70	90
Nitrogen - Organic	0	9.3	11	6.2	24
Nitrogen - Nitrate	2.30	1.5	1.8	0.6	0.23
Phosphate-Total, as P	4.8	4.0	5.0	20.2	13
P.C.B. ppb					
Potassium	76		75		
Sodium	154		130		
Solids - T.D.S.	2,820	3,524	3,188	2,692	3,136
Solids - T.S.S.					
Solids - Settle. ml/l			3.0		
Sulphate			203		
Temperature** (°C)	15.0	16.0	16.0	18.0	20.0
Volatile Acids	3,720		2,940		
Zinc	33		0.5		
pH	5.3	5.0	5.2	5.2	4.6

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-8K

LEACHATE ANALYSIS
CELL C

	SAMPLE DATE				
COMPONENT *	6-19-74				
Alkalinity	465				
B.O.D.	3,000				
Cadmium	0.014				
Calcium	321				
C.O.D.	6,450				
Chloride	88				
Color (Color Units)					
Copper	0.096				
Dissolved Oxygen ppm	1.1				
Elect. Cond. μ mhos/cm	3,000				
Fecal Coli. MPN/100 ml	< 30				
Fecal Strep. MPN/100 ml	930				
Iron	296				
Lead	0.16				
Magnesium	75				
Mercury	0.0017				
Nitrogen - Ammonia	75				
Nitrogen - Organic	7.9				
Nitrogen - Nitrate	.016				
Phosphate-Total, as P	12				
P.C.B. ppb	ND				
Potassium	75				
Sodium	100				
Solids - T.D.S.	2,920				
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate					
Temperature** (°C)	20.0				
Volatile Acids	3,060				
Zinc	3.16				
pH	5.3				
Total Sulphides	0				

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-8L

LEACHATE ANALYSIS

CELL D

	SAMPLE DATE				
COMPONENT *	1-7-72	1-11-72	1-18-72	2-15-72	3-2-72
Temperature** (°C)	13.0	8.0	9.0	18.5	16.5
Alkalinity ($CaCO_3$)			3050	4450	4800
B.O.D.			20,400	20,850	22,050
Cadmium			0.1		< 0.1
Calcium			1560	1300	1400
C.O.D.			89,520	26,300	29,800
Color (Color Units)			1300	550	440
Copper			0.4		0.25
Chloride			1210	1030	980
Dissolved Oxygen ppm	0.8	1.1	1.0	0.4	1.1
Elect.Cond. μ mhos/cm	7800	12,000	12,000	11,000	9000
Fecal Coli. MPN/100 ml			3.0		
Fecal Strep. MPN/100 ml			29,000,000		
Lead			2.0		< 0.5
Magnesium			560	500	500
Mercury			0.003		0.0058
Nitrogen - Ammonia			194	350	408
Nitrogen - Organic			210	270	182
Nitrogen - Nitrate			4.70	3.1	1.90
Nitrogen - Nitrite			0.080		
Phosphate-Total, as P			79.2	41.2	25
P.C.B. ppb			0***		0
Potassium			910		740
Sodium			980		900
Solids - T.D.S.			21,010	14,196	16,252
Solids - T.S.S.			238	122	32
Solids - Settle. ml/l			< 0.1		
Volatile Acids			8850		8690
Zinc			95		40
pH	4.6		4.6	5.0	5.1
Sulphate				1040	

* Units in mg/l unless noted

**Temperature of Sample when tested for DO, EC and pH.

***Detected .07 ppb Lindane.

Project 102-1.3

Plate H-9A

LEACHATE ANALYSIS

CELL D

	SAMPLE DATE				
COMPONENT *	3-14-72	3-28-72	4-11-72	4-25-72	5-9-72
Temperature** (°C)	19.5	17.5	17.0	20.0	19.0
Alkalinity ($CaCO_3$)	5950	5050	4950	4700	5500
B.O.D.	24,000	22,800	21,750	19,800	23,100
Cadmium			< 0.1		< 0.1
Calcium	1200	1300	900	1000	1000
C.O.D.	30,300	31,900	32,330	30,700	33,640
Color (Color Units)	270	520	1700	900	600
Copper			< 0.25		< 0.2
Chloride	1020	1020	920	1020	1090
Dissolved Oxygen ppm	0.1	0.4	0.6	0.5	0.2
Elect.Cond. μ mhos/cm	12,000	10,000	10,000	9000	12,500
Fecal Coli. MPN/100 ml	3	< 3	< 3	< 3	6
Fecal Strep. MPN/100 ml	23,000	43,000	2000	430,000	< 3
Lead			1.0		< 1.0
Magnesium	450	500	600	550	500
Mercury			0.0028		0.0066
Nitrogen - Ammonia	378	360	423	500	580
Nitrogen - Organic	306	209	207	236	264
Nitrogen - Nitrate	3.0	3.80	3.60	4.22	2.38
Nitrogen - Nitrite					
Phosphate-Total, as P	40	36.0	17.8	22.1	28.7
P.C.B. ppb		0.20		0	
Potassium			727		727
Sodium			860		1020
Solids - T.D.S.	15,994	16,948	16,132	15,240	16,110
Solids - T.S.S.	88	50	228	58	409
Solids - Settle. ml/l	0.15	0.4	< 0.1	< 0.1	< 0.1
Volatile Acids	8430	10,190	8,300	10,200	10,900
Zinc			40		30
pH	5.1	5.1		5.2	5.2
Sulphate	920		794		920

* Units in mg/l unless noted

**Temperature of sample when tested for DO, EC, and pH.

Project 102-1.3

Plate H-9B

LEACHATE ANALYSIS
CELL D

COMPONENT *	SAMPLE DATE 5-23-72	6-6-72	6-20-72	7-11-72	7-25-72
Alkalinity	5600	5800	4500	6500	7900
B.O.D.	33,600	30,600	33,000	25,950	24,400
Cadmium		0.13		<0.1	0.1
Calcium	1300	1800	1200	1320	1416
C.O.D.	36,040	34,524	33,040	35,060	36,400
Chloride	1090	1050	1100	1030	1070
Color (Color Units)	360	350	400		
Copper		0.10		0.15	0.16
Dissolved Oxygen ppm	0.1	0.2	0.2	0.4	0.0
Elect. Cond. µ mhos/cm	12,200	13,000	12,750	13,000	15,000
Fecal Coli. MPN/100 ml	< 3	9.2			
Fecal Strep. MPN/100 ml	240	2300			
Iron				180	185
Lead		0.5		0.18	0.35
Magnesium	360	420	420	500	656
Mercury		0.0052		0.0045	
Nitrogen - Ammonia	720	880	592	560	612
Nitrogen - Organic	332	864	440	142	151
Nitrogen - Nitrate	3.1	3.0	6.34	0.16	
Phosphate-Total, as P	32.0	27.7	28.1	12.4	
P.C.B. ppb	0				
Potassium		760		800	830
Sodium		950		880	944
Solids - T.D.S.	17,970	14,610	17,450	21,220	18,460
Solids - T.S.S.	40	50	34	75	97
Solids - Settle. ml/l	0.1	0.6			
Sulphate		908			
Temperature** (°C)	18.5	20.0	21.0	23.5	23.5
Volatile Acids	11,400	11,300		10,750	
Zinc		30		28	28
pH	5.2	5.1	5.2	5.2	4.9

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

LEACHATE ANALYSIS
CELL D

COMPONENT *	SAMPLE DATE 8-8-72	8-23-72	9-7-72	9-20-72	10-11-72
Alkalinity	7700	6000	7900	8000	3430
B.O.D.	24,300	21,550	21,800	22,500	25,800
Cadmium	< 0.1		<0.1		< 0.1
Calcium	1440	1400	1380	1430	1402
C.O.D.	28,610	34,320	33,660	35,550	36,700
Chloride	1080	1070	1080	1250	1159
Color (Color Units)		250	250	290	290
Copper	0.14		0.15		0.25
Dissolved Oxygen ppm	0.3	0.4	0.1	0.8	0.0
Elect. Cond. µ mhos/cm	14,500	15,200	13,000	14,000	14,000
Fecal Coli. MPN/100 ml	3		9.2		< 3
Fecal Strep. MPN/100 ml	<3		< 3		<3
Iron	175		165		208
Lead	0.64		0.36		0.59
Magnesium	510	535	495	545	568
Mercury	0.0095		0.005		0.005
Nitrogen - Ammonia	570	638	604	596	702
Nitrogen - Organic	149	156	161	167	190
Nitrogen - Nitrate	0.08	2.6	0.2	0.2	0
Phosphate-Total, as P	10.0	23.0	16.0	15.0	8.0
P.C.B. ppb			0		
Potassium	780		740		750
Sodium	1010		888		960
Solids - T.D.S.	18,740	20,540	18,900	20,200	19,540
Solids - T.S.S.	420	264	480	102	370
Solids - Settle. ml/l			<0.05		
Sulphate			600		
Temperature** (°C)	23.5	25.0	25.0	22.0	18.0
Volatile Acids	12,750		12,500		13,600
Zinc			21.5		29.5
pH	5.3	5.1	5.1	5.0	5.1

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

LEACHATE ANALYSIS
CELL D

COMPONENT *	SAMPLE DATE 10-24-72	11-8-72	11-21-72	11-30-72	12-19-72
Alkalinity	4500	4900	4600	4700	4214
B.O.D.	25,200	25,800	25,200	27,250	26,200
Cadmium	0.16	0.09	0.04	0.05	< 0.1
Calcium	1380	1330	1440	1354	1402
C.O.D.	34,840	33,260	34,340	34,300	27,250
Chloride	1200	1100	1520	1560	1565
Color (Color Units)	370	375	225	260	275
Copper	0.10	0.35	0.32	0.11	0.07
Dissolved Oxygen ppm	9.4	0.2	0.05	0.15	0.2
Elect. Cond. µ mhos/cm	15,500	10,000	9000	12,000	9750
Fecal Coli. MPN/100 ml		< 3		< 3	
Fecal Strep. MPN/100 ml		< 3		3	
Iron	185	185	180	200	
Lead	0.47	0.32	0.37	0.55	
Magnesium	508	560	630	580	
Mercury		0.0008		0.0035	
Nitrogen - Ammonia	630	556	561	580	522
Nitrogen - Organic	180	146	137	134	101
Nitrogen - Nitrate	0.1	0.0	0.0	0.05	0.4
Phosphate-Total, as P	4.0	11.0	3.0	4.4	1.8
P.C.B. ppb				0	
Potassium	800	760	730	690	584
Sodium	1010	910	800	880	848
Solids - T.D.S.	17,000	17,000	17,400	17,380	14,980
Solids - T.S.S.	80	600	600	412	90
Solids - Settle. ml/l				0	
Sulphate				467	
Temperature ** (°C)	23.0	20.5	17.0	14.0	13.0
Volatile Acids	12,600	11,200	12,400	12,800	
Zinc	28.5	27.5	25.0	11.5	21.5
pH	5.0	5.1	5.2	5.2	5.2

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-9E

LEACHATE ANALYSIS
CELL D

COMPONENT *	SAMPLE DATE 1-10-73	1-23-73	2-6-73	2-27-73	3-13-73
Alkalinity	4410	4214	4620	1680	4935
B.O.D.	26,100	25,700	18,200	21,400	20,800
Cadmium	<0.1	<0.1	<0.1	< 0.05	< 0.05
Calcium	1426	962	561	1322	1400
C.O.D.	30,100	31,200	31,600	29,800	29,700
Chloride	1174	1062	1129	1225	1320
Color (Color Units)	150	100	75	175	150
Copper	0.29	0.08	0.11	0.12	0.09
Dissolved Oxygen ppm	0.4	0.2	0.7***	0.4	0.5
Elect. Cond. µ mhos/cm	12,250	8,600	6750	7000	7000
Fecal Coli. MPN/100 ml	6		< 3.0		
Fecal Strep. MPN/100 ml	3		3.0		
Iron	200	230	212	300	255
Lead	0.43	0.40	0.23	0.46	0.24
Magnesium	560	552	576	636	388
Mercury	0.011	0.0156	0.0076	0.0209	0.0084
Nitrogen - Ammonia	474	513	498	500	480
Nitrogen - Organic	95	119	107	128	90
Nitrogen - Nitrate	0.50	0.08	0.18	0.36	0.1
Phosphate-Total, as P	8.0	8.0	5.6	2.2	1.8
P.C.B. ppb					0
Potassium	656	740	740	640	610
Sodium	872	896	928	948	888
Solids - T.D.S.	16,900	16,440	16,720	16,360	16,880
Solids - T.S.S.	72	22	28	66	72
Solids - Settle. ml/l					
Sulphate					440
Temperature ** (°C)	12.0	13.0	13.0	13.0	14.0
Volatile Acids	11,800		12,200		12,100
Zinc	21.0	22.5	17.8	17.6	16.9
pH	5.1	5.3	4.8	5.5	5.0

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.
*** Questionable Result

Project 102-1.3

Plate H-9F

LEACHATE ANALYSIS

CELL D

COMPONENT *	SAMPLE DATE				
	3-27-73	4-10-73	4-24-73	5-15-73	6-5-73
Alkalinity	5460	4410	4935	4515	4200
B.O.D.	21,400	24,200	24,100	16,100	15,800
Cadmium	<0.05	<0.05	<0.05	<0.05	<0.05
Calcium	1386	1386	1600	1218	1080
C.O.D.	29,500	29,100	28,500	24,450	22,700
Chloride	1380	1115	1160	1450	1565
Color (Color Units)	150	100	125		
Copper	0.12	0.08	0.06	0.04	0.10
Dissolved Oxygen ppm	0.3	0.3	0.8	0.5	0.4
Elect. Cond. µ mhos/cm	6000	6000	6000	4800	6000
Fecal Coli. MPN/100 ml					
Fecal Strep. MPN/100 ml					
Iron	248	275	290	240	215
Lead		<0.1	0.50	0	0
Magnesium	612	556	604	672	528
Mercury		0.002	0.0016	0.0022	
Nitrogen - Ammonia	516	519	563	290	543
Nitrogen - Organic	90	61	77	34	74
Nitrogen - Nitrate	0.24		0.48	1.12	0.3
Phosphate-Total, as P	6.8	1.4	3.4	4.0	2.4
P.C.B. ppb					
Potassium	680	610	640	280	
Sodium	904	880	856	880	
Solids - T.D.S.	17,680	17,280	16,970	15,600	14,800
Solids - T.S.S.	50	52	68	32	
Solids - Settle. ml/l					
Sulphate				316	
Temperature** (°C)	14.0	17.0	17.0	18.7	19.5
Volatile Acids		12,300		9900	
Zinc	17.5	14.0	15.0	12.0	7.6
pH	5.3	5.3	5.4	4.9	5.5

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-9G

LEACHATE ANALYSIS

CELL D

COMPONENT *	SAMPLE DATE				
	6-26-73	7-17-73	8-7-73	8-29-73	9-18-73
Alkalinity	4410	4515	4200	4300	4400
B.O.D.	15,500	19,400	11,100	11,400	8300
Cadmium	<0.05	<0.05	<0.05		<0.05
Calcium	946	818	697	577	561
C.O.D.	21,600	18,220	15,100	11,900	8300
Chloride	1145	1032	1,051	993	954
Color (Color Units)		-			
Copper	0.08	0.08	0.05		0.09
Dissolved Oxygen ppm	0.40	0.40	0.60		0.40
Elect. Cond. µ mhos/cm	5600	5100	6,000	6,700	3900
Fecal Coli. MPN/100 ml	20.0	-	-		-
Fecal Strep. MPN/100 ml	7.0	-	-		-
Iron	203	205	185		85
Lead	0.31	<0.1	0.37		0.20
Magnesium	316	536	452	428	396
Mercury	0		0		
Nitrogen - Ammonia	551	526	512	503	477
Nitrogen - Organic	68	80	74	74	71
Nitrogen - Nitrate	1.60	1.42	1.16	1.40	1.10
Phosphate-Total, as P	4.4	3.0	3.0	7.2	4.0
P.C.B. ppb		0.6			
Potassium	260	450	510		510
Sodium	408	784	784		704
Solids - T.D.S.	14,600	13,840	12,360	10,680	5040
Solids - T.S.S.		-	-		
Solids - Settle. ml/l		-	-		0.15
Sulphate	257				82
Temperature** (°C)	24.5	20.0	19.2	24.0	23.0
Volatile Acids	9540	-	6480	-	
Zinc	8.5	17.5	3.5	-	4.5
pH	5.8	5.9	5.1	4.9	6.1

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-9H

LEACHATE ANALYSIS
CELL D

COMPONENT *	SAMPLE DATE 10-9-73	10-30-73	11-30-73	12-13-73	1-4-74
Alkalinity	4500	4300	4200	4998	3,672
B.O.D.	4400	3100	3200	2100	1,300
Cadmium	<0.05	<0.05	<0.05	0	
Calcium	480	521	641	602	442
C.O.D.	5470	4650	5960	3550	2,336
Chloride	964	940	902	2148	998
Color (Color Units)					
Copper		0.12	0.28	0.08	
Dissolved Oxygen ppm	0.6	0.6	0.4	0.6	
Elect. Cond. µ mhos/cm	4200	8400	6000	4400	3,000
Fecal Coli. MPN/100 ml				2400	
Fecal Strep. MPN/100 ml				43	
Iron		54	65	50	
Lead		<0.2	0.24	0.53	
Magnesium	368	360	336	345	317
Mercury		0	0.004	0.0036	
Nitrogen - Ammonia	347	350	308	323	283
Nitrogen - Organic	88	48	56	68	60
Nitrogen - Nitrate	1.34	0.6	0.3	0.9	0.5
Phosphate-Total, as P	8.0	4.0	6.0	7.6	5.2
P.C.B. ppb					0
Potassium		425	430	410	
Sodium		770		670	
Solids - T.D.S.	7600	6770	7800	6424	5,484
Solids - T.S.S.					
Solids - Settle. ml/l				<1.0	
Sulphate				222	
Temperature ** (°C)	24.0	25.0	17.5	18.0	14.0
Volatile Acids		1560	2160	960	
Zinc		3.0	3.2	2.4	
pH	6.6	6.6	6.5	6.7	6.4

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-9I

LEACHATE ANALYSIS
CELL D

COMPONENT *	SAMPLE DATE 1-22-74	2-12-74	3-6-74	3-28-74	4-17-74
Alkalinity	3,854	4,432	3,534	2,139	3,255
B.O.D.	1,000	1,100	1,200	398	317
Cadmium	0.012		0.005		0.017
Calcium	402	393	361	376	2,404
C.O.D.	1,328	1,352	1,214	797	792
Chloride	1,311	2,388	1,959	10,043	978
Color (Color Units)					
Copper	0.03		0.045		0.055
Dissolved Oxygen ppm	1.0	0.8	0.8	0.6	0.6
Elect. Cond. µ mhos/cm	1,500	7,000	8,000	6,200	7,500
Fecal Coli. MPN/100 ml					
Fecal Strep. MPN/100 ml					
Iron	56		60		62
Lead	0.13		<0.01		< 0.01
Magnesium	322	264	274	330	375
Mercury	0.015		0.0011		0.041
Nitrogen - Ammonia	263	267	145	169	187
Nitrogen - Organic	46	45	16	30	29
Nitrogen - Nitrate	0.3	0.3	0.06	0.3	0.5
Phosphate-Total, as P	4.0	3.0	1.0	1.0	1.5
P.C.B. ppb					
Potassium	395		352		333
Sodium	645		550		600
Solids - T.D.S.	5,004	5,148	4,668	4,800	4,604
Solids - T.S.S.					
Solids - Settle. ml/l					<1.0
Sulphate					581
Temperature ** (°C)	18.0	14.1	16.0	17.0	15.5
Volatile Acids	300		300		1,200
Zinc	1.6				1.12
pH	6.5	6.6	6.6	6.3	6.7
Total Sulphides		0			

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-9J

LEACHATE ANALYSIS
CELL D

COMPONENT *	SAMPLE DATE 5-7-74	 5-28-74	 6-19-74		
Alkalinity	3,627	3,348	3,348		
B.O.D.	280	434	375		
Cadmium			.015		
Calcium	433	385	513		
C.O.D.	823	1,259	2,566		
Chloride	881	874	783		
Color (Color Units)					
Copper			0.06		
Dissolved Oxygen ppm	0.7	0.6	0.6		
Elect. Cond. µ mhos/cm	6,200	6,900	5,500		
Fecal Coli. MPN/100 ml			<30		
Fecal Strep. MPN/100 ml			<30		
Iron			144		
Lead			0.25		
Magnesium	340	306	250		
Mercury			0.0014		
Nitrogen - Ammonia	190	256	240		
Nitrogen - Organic	29	35	39.6		
Nitrogen - Nitrate	0.7	0.12	0.055		
Phosphate-Total, as P	7.7	0.5	5		
P.C.B. ppb			ND		
Potassium			30		
Sodium			500		
Solids - T.D.S.	4,720	4,665	4,325		
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate					
Temperature** (°C)	17.5	18.5	19.0		
Volatile Acids			120		
Zinc			0.70		
pH	6.6	6.5	6.6		
Total Sulphides			0		

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 Plate H-9K

LEACHATE ANALYSIS
CELL E

COMPONENT *	SAMPLE DATE 12-15-71	12-21-71	1-3-72	1-11-72	1-18-72
Alkalinity $(CaCO_3)$			704		626
B.O.D.			1,730		1,020
Cadmium			<0.25		
Calcium			200		170
C.O.D.			1,986		1,430
Chloride			210		170
Color (Color Units)					450
Copper			0.45		
Dissolved Oxygen ppm		2.4	1.6	0.8	1.6
Elect. Cond. µ mhos/cm		3,200		2,200	2,000
Fecal Coli. MPN/100 ml			9		240
Fecal Strep. MPN/100 ml			400		24,000
Iron					
Lead			≤2.0		
Magnesium			150		1[illegible]
Mercury			0.004		
Nitrogen - Ammonia			11.6		4.40
Nitrogen - Organic			350		55[illegible]
Nitrogen - Nitrate			1.0		0.87
Phosphate-Total, as P			0.35		2.3
P.C.B. ppb				0	
Potassium			24		
Sodium			115		
Solids - T.D.S.			2,948		2,186
Solids - T.S.S.			60		10.0
Solids - Settle. ml/l			<0.1		0.1
Sulphate					
Temperature** (°C)			13.0	8.0	8.0
Volatile Acids			480		
Zinc			0.15		
pH	6.5	6.5	5.8		6.2

* Units in mg/l unless noted.

** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 Plate H-10A

LEACHATE ANALYSIS
CELL E

COMPONENT *	SAMPLE DATE 2-15-72	3-2-72	3-14-72	10-24-72	11-30-72
Alkalinity	620		550	3720	3040
B.O.D.	480			16,800	25,250
Cadmium		<0.1		0.09	0.06
Calcium	130			1060	1080
C.O.D.	216		2580	24,450	33,300
Chloride	102		300	750	950
Color (Color Units)	420		600	440	375
Copper	<0.2			0.12	0.03
Dissolved Oxygen ppm	1.1		6.6	0.6	0.4
Elect. Cond. µ mhos/cm	1400			7000	9000
Fecal Coli. MPN/100 ml				6.1	<3
Fecal Strep. MPN/100 ml				24,000	<3
Iron				453	483
Lead	<0.5			0.60	0.32
Magnesium	100			736	544
Mercury	0.0005			0.0172	0.0064
Nitrogen - Ammonia	6.1		5.6	220	382
Nitrogen - Organic	13.2		27.0	140	132
Nitrogen - Nitrate	0.6		0.8	0.3	0
Phosphate-Total, as P	2.6		3.0	3.0	3.2
P.C.B. ppb				0	
Potassium	8.4		25	340	610
Sodium	71		120	364	656
Solids - T.D.S.	1212		2800	13,200	15,400
Solids - T.S.S.	54		240	940	420
Solids - Settle. ml/l			~1		
Sulphate	0.0		0.0	300	456
Temperature** (°C)	18.0		22.5	20.0	6.5
Volatile Acids	552		430		11,800
Zinc	<0.1			1.67	6.5
pH	5.7		6.5	5.2	4.9

* Units in mg/l unless noted.

** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 Plate H-10B

LEACHATE ANALYSIS
CELL E

COMPONENT *	SAMPLE DATE 1-23-73	3-13-73	4-24-73	6-5-73	6-26-73
Alkalinity	4700	11,025	8910	5250	8925
B.O.D.	33,200	40,000	50,500	42,800	47,300
Cadmium	<0.1	<0.05	<0.05	<0.05	<0.05
Calcium	1360	1844	2160	2600	2605
C.O.D.	41,700	58,100	51,900	62,000	65,600
Chloride	823	1565	1760	1565	1830
Color (Color Units)	175	425	375		
Copper	0.1	0.19	0.32	0.10	0.10
Dissolved Oxygen ppm	0.3	0.6	0.6	0.4	0.20
Elect. Cond. μ mhos/cm	9000	9500	8000	20,000	9800
Fecal Coli. MPN/100 ml	<3.0	< 3.0	3.0		< 3.0
Fecal Strep. MPN/100 ml	3.0	< 3.0	<3.0		< 3.0
Iron	370	478	520	525	500
Lead	0.60	0.45	0.21	0.42	0.73
Magnesium	536	676	896	896	956
Mercury	0.0144	0.010	0.006		0.0174
Nitrogen - Ammonia	602	690	895	946	946
Nitrogen - Organic	248	35	483	531	560
Nitrogen - Nitrate	0	0	0.40	0	0.48
Phosphate-Total, as P	6.4	5.6	10.0	16.0	3.6
P.C.B. ppb		0			
Potassium	1040	1400	1430	1320	1470
Sodium	880	1110	1216	1264	1344
Solids - T.D.S.	18,420	26,680	31,680	30,000	35,240
Solids - T.S.S.	60	164	80		
Solids - Settle. ml/l					
Sulphate		958			1106
Temperature** (^{o}C)	8.0	14.0	17.0	19.0	29.0
Volatile Acids	13,900	18,100	19,200		19,560
Zinc	41.0	56.4	64.0	58	61
pH	5.1	4.8	5.2	5.2	5.3

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-10C

LEACHATE ANALYSIS
CELL E

COMPONENT *	SAMPLE DATE 8-7-73	8-29-73	9-18-73	10-30-73	11-20-73
Alkalinity	8800	8000	8600	8300	8800
B.O.D.	45000	51000	52000	49,000	44,500
Cadmium	<0.05		<0.1	<0.05	<0.05
Calcium	2164	2200	2525	2525	2525
C.O.D.	65600	64500	61300	67,500	65,060
Chloride		1910	1900	2019	2085
Color (Color Units)					
Copper			0.13	0.12	0.12
Dissolved Oxygen ppm	0.40	0.50	0.90	1.0	0.1
Elect. Cond. μ mhos/cm	12000	11700	7250	19,000	14,000
Fecal Coli. MPN/100 ml			-		
Fecal Strep. MPN/100 ml			-		
Iron	550		540	590	615
Lead	0.69		0.54	<0.2	0.65
Magnesium	984	944	964	936	904
Mercury				0.0084	0.0144
Nitrogen - Ammonia	958	682	963	823	848
Nitrogen - Organic	571	509	580	563	515
Nitrogen - Nitrate	0.56	0.4	0	<0.1	0.6
Phosphate-Total, as P	32	19	19	24	20
P.C.B. ppb					
Potassium	1520		1630	1180	1570
Sodium	1368		1200	1280	
Solids - T.D.S.	36000	35120	26880	36,400	34,640
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate			1284		
Temperature** (^{o}C)	21.5	27.4	22.0		15.5
Volatile Acids	22100			21,420	21,300
Zinc	32.5		62.0	68.0	18.0
pH	5.3	4.8	4.8	5.4	5.5

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate A-10D

LEACHATE ANALYSIS

CELL E

	SAMPLE DATE				
COMPONENT *	12-13-73	1-22-74	3-6-74	4-17-74	6-19-74
Alkalinity	13,770	11,562	11,811	5,301	3,720
B.O.D.	46,500	40,700	33,000	42,750	29,000
Cadmium	0.07	0.073	0.070	0.068	0.055
Calcium	2369	2,329	2,444		2,806
C.O.D.	65,200	65,116	52,853	66,400	64,855
Chloride	2699	2,176	4,115	4,892	2,064
Color (Color Units)					
Copper	0.22	0.09	0.17	0.372	1.44
Dissolved Oxygen ppm	0.09	0.8	2.4	1.2	0.9
Elect. Cond. µ mhos/cm	9000	4,500	15,000	19,000	15,000
Fecal Coli. MPN/100 ml	<3				<30
Fecal Strep. MPN/100 ml	<3				<30
Iron	625	584	700	540	644
Lead	1.0	0.38	0.62	0.50	0.86
Magnesium	630	933	1,040	933	874
Mercury	.07	0.05	<0.001	0.024	0.001
Nitrogen - Ammonia	888	925	776	834	244
Nitrogen - Organic	614	563	410	507	1,018
Nitrogen - Nitrate	0	0.3	0.06	0.30	0.33
Phosphate-Total, as P	26	5.0	7.2	4	22
P.C.B. ppb		0			
Potassium	1750	1,599	1,720	1,542	1,063
Sodium	1320	1,374	1,185	1,334	1,650
Solids - T.D.S.	32,450	32,188	33,356	30,452	30,610
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate	1270			1,614	
Temperature ** (°C)	13.0	17.5	13.5	15.0	24.0
Volatile Acids	18,780	20,460	21,960	21,180	21,780
Zinc	18.5	70.8	109	50	85
pH	5.5	5.3	5.5	5.4	6.1
Total Sulphides					0

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 Plate H-10E

WATER ANALYSIS

WATER ADDED TO CELL C

COMPONENT *	SAMPLE DATE 12-28-71	3-2-72	3-14-72	4-11-72	4-25-72
Alkalinity ($CaCO_3$)	0.0				304
B.O.D.	1.0				3.0
Cadmium					<0.1
Calcium	36				20
C.O.D.	850				0
Chloride	73				70
Color (Color Units)	5				0
Copper					<0.25
Dissolved Oxygen ppm	7.6	8.8	9.2	8.9	7.9
Elect. Cond. μ mhos/cm	750	650	700	750	800
Fecal Coli. MPN/100 ml	<3				<3
Fecal Strep. MPN/100 ml	---				11,000
Iron					
Lead					<1.0
Magnesium	36				25
Mercury					0.026
Nitrogen - Ammonia	0.1				0.17
Nitrogen - Organic	0.00				0.60
Nitrogen - Nitrate	0.10				0.24
Phosphate-Total, as P					0.29
P.C.B. ppb	0				0
Potassium					7.3
Sodium					114
Solids - T.D.S.	502				476
Solids - T.S.S.	1.0				0
Solids - Settle. ml/l	NIL				0
Sulphate					78
Temperature** (°C)		15.0	18.0	14.0	18.5
Volatile Acids	432				0
Zinc					<0.05
pH	7.2	7.8	7.6		7.7

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 Plate H-11A

WATER ANALYSIS

WATER ADDED TO CELL C

COMPONENT *	SAMPLE DATE 5-9-72	5-23-72	6-6-72	6-20-72	7-11-72
Alkalinity					
B.O.D.					
Cadmium					
Calcium					
C.O.D.					
Chloride					
Color (Color Units)					
Copper					
Dissolved Oxygen ppm	9.8	7.0	7.2	7.0	7.3
Elect. Cond. μ mhos/cm	600	750	675	900	800
Fecal Coli. MPN/100 ml					
Fecal Strep. MPN/100 ml					
Iron					
Lead					
Magnesium					
Mercury					
Nitrogen - Ammonia					
Nitrogen - Organic					
Nitrogen - Nitrate					
Phosphate-Total, as P					
P.C.B. ppb					
Potassium					
Sodium					
Solids - T.D.S.					
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate					
Temperature** (°C)	19.0	21.0		19.0	24.0
Volatile Acids					
Zinc					
pH	7.5	7.7	7.8	7.9	7.9

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 Plate H-11B

WATER ANALYSIS
WATER ADDED TO CELL C

	SAMPLE DATE				
COMPONENT *	7-25-72	8-8-72	9-7-72	10-11-72	11-8-72
Alkalinity	330				
B.O.D.	0				
Cadmium	0				
Calcium	22				
C.O.D.	12				
Chloride	57				
Color (Color Units)					
Copper	0.07				
Dissolved Oxygen ppm	6.4	7.4	7.0	8.0	9.4
Elect. Cond. µ mhos/cm	800	800	825	800	950
Fecal Coli. MPN/100 ml					
Fecal Strep. MPN/100 ml					
Iron	0.5				
Lead	0.15				
Magnesium	16				
Mercury	0.0136				
Nitrogen - Ammonia					
Nitrogen - Organic					
Nitrogen - Nitrate					
Phosphate-Total, as P					
P.C.B. ppb					
Potassium	7.9				
Sodium	152				
Solids - T.D.S.	536				
Solids - T.S.S.	<0.5				
Solids - Settle. ml/l					
Sulphate	32				
Temperature ** (°C)	23.5	19.5	23.5	16.0	14.5
Volatile Acids	0				
Zinc	0.09			1	
pH	7.3	7.8	7.9	8.0	8.0

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 PlateH-11C

WATER ANALYSIS
WATER ADDED TO CELL C

	SAMPLE DATE				
COMPONENT *	11-30-72	1-10-73	2-6-73	3-27-73	6-26-73
Alkalinity	304			292	286
B.O.D.	<2				
Cadmium	0			0	0
Calcium	43			28	26
C.O.D.	2			0	4.0
Chloride	56			50	49
Color (Color Units)	4				
Copper	0.04			0.06	0
Dissolved Oxygen ppm	9.0	9.4	8.6	8.8	6.3
Elect. Cond. µ mhos/cm	850	700	650	800	980
Fecal Coli. MPN/100 ml	<3				<3.0
Fecal Strep. MPN/100 ml	4				<3.0
Iron	0.3			0.20	0.2
Lead	0			0	0
Magnesium	11			29	17
Mercury	0.0102			0	0
Nitrogen - Ammonia	0				0
Nitrogen - Organic	0				0
Nitrogen - Nitrate	0.23				0.56
Phosphate-Total, as P					
P.C.B. ppb	0				
Potassium	5.7			8.7	8.5
Sodium	132			124	24
Solids - T.D.S.	440			480	1040
Solids - T.S.S.				0	
Solids - Settle. ml/l					
Sulphate	25			38	97
Temperature ** (°C)	10	9	12.5	14.0	30.1
Volatile Acids					
Zinc	0.03			0.07	0.06
pH	8.0	7.6	7.4	7.7	7.95

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 Plate H-11D

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WATER ANALYSIS

WATER ADDED TO CELL C

	SAMPLE DATE				
COMPONENT *	9-18-73	12-13-73	5-7-74	6-19-74	
Alkalinity	294	136	130	93	
B.O.D.		<2.4		0.9	
Cadmium	0	0	< 0.01	<0.01	
Calcium	24	39	42	32	
C.O.D.	0	3.9	2.4	5	
Chloride	50	74	18.1	25	
Color (Color Units)					
Copper	0.02	0.05	< 0.01	<0.02	
Dissolved Oxygen ppm	8.0	6.9	7.4	7.2	
Elect. Cond. µ mhos/cm	850	320	320	300	
Fecal Coli. MPN/100 ml	-	< 3			
Fecal Strep. MPN/100 ml	-	4			
Iron	0.3	1.4	0.58	0.56	
Lead	0.13	0	< 0.01	0.04	
Magnesium	15	4	4.8	6.6	
Mercury		0	<0.001	0.0005	
Nitrogen - Ammonia		0		0	
Nitrogen - Organic				2.6	
Nitrogen - Nitrate				0.17	
Phosphate-Total, as P					
P.C.B. ppb					
Potassium	7.5	2.8	2.46	3.6	
Sodium	126	30	24	28.3	
Solids - T.D.S.	560	288	233	263	
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate	33.0	34	69		
Temperature** (°C)	22.0	14.0	21.0	22.0	
Volatile Acids					
Zinc	0.04		0.24	1.5	
pH	7.4	9.2	6.3	7.8	

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-11E

GROUNDWATER ANALYSIS

WELL 1

	SAMPLE DATE				
COMPONENT *	1-3-72	1-18-72	3-2-72	3-14-72	3-28-72
Temperature** (°C)	15.0	11.0	15.5	23.0	15.5
Alkalinity ($CaCO_3$)		202	88	184	124
B.O.D.		31	3		
Cadmium		<0.05	<0.1		
Calcium		78	10		
C.O.D.		8.58	120		
Color (Color Units)					
Copper		<0.2	<0.2		
Chloride		60	27	60	53
Dissolved Oxygen ppm	8.3	6.8	5.8	5.4	6.4
Elect.Cond. μ mhos/cm		750	260	400	430
Fecal Coli. MPN/100 ml		15	2400		
Fecal Strep. MPN/100 ml					
Lead		<0.5	<0.5		
Magnesium		40	43		
Mercury		0.0003	0.0004		
Nitrogen - Ammonia		0.160	0.084		
Nitrogen - Organic					
Nitrogen - Nitrate		0.30	1.07		
Nitrogen - Nitrite		0.013			
Phosphate - Total, as P					
P.C.B. ppb		0			
Potassium		2.35	3.15		
Sodium		96.0	50		
Solids - T.D.S.		636	716	508	452
Solids - T.S.S.					
Solids - Settle. ml/l					
Volatile Acids					
Zinc		0.9	1.2		
pH	7.3	7.3	7.1	7.3	7.1
Sulphate			9.2		

* Units in mg/l unless noted
**Temperature of sample when tested for DO, EC, and pH.

Project 102-1.3

Plate H-12A

GROUNDWATER ANALYSIS

WELL 1

	SAMPLE DATE				
COMPONENT *	4-11-72	4-25-72	5-9-72	5-23-72	6-6-72
Temperature** (°C)	17.5	16.0	20.0	18.0	17.0
Alkalinity ($CaCO_3$)	121	122	136	134	132
B.O.D.	2		2		
Cadmium	< 0.1		< 0.1		
Calcium	11		12		
C.O.D.	16		23		38
Color (Color Units)					
Copper	< 0.25		<0.2		
Chloride	58.5	60	51	54	62
Dissolved Oxygen ppm	5.8	6.5	4.0	4.3	4.2
Elect.Cond. μ mhos/cm	400	410	450	450	475
Fecal Coli. MPN/100 ml	23		460		4
Fecal Strep. MPN/100 ml					
Lead	< 1.0		<1.0		
Magnesium	45		20		
Mercury	0.0050		0.0047		
Nitrogen - Ammonia	0		0.149		0.096
Nitrogen - Organic					
Nitrogen - Nitrate	0.74		0.50		0.12
Nitrogen - Nitrite					
Phosphate - Total, as P					
P.C.B. ppb					
Potassium	3.1		5.9		4.9
Sodium	64.8		75		78
Solids - T.D.S.	486	470	296	482	272
Solids - T.S.S.					
Solids - Settle. ml/l					
Volatile Acids					
Zinc	0.1		0.1		
pH		7.1	7.4	7.3	7.0
Sulphate					

* Units in mg/l unless noted
**Temperature of sample when tested for DO, EC, and pH.

Project 102-1.3

Plate H-12B

GROUNDWATER ANALYSIS
WELL 1

COMPONENT *	SAMPLE DATE 7-11-72	7-25-72	8-8-72	9-7-72	10-11-72
Alkalinity		200		160	
B.O.D.					
Cadmium		0		0	
Calcium		19		10	
C.O.D.				3	
Chloride				59	
Color (Color Units)					
Copper		<0.02		0	
Dissolved Oxygen ppm	2.9	4.2	4.2	8.3	4.8
Elect. Cond. µ mhos/cm	520	525	500	500	530
Fecal Coli. MPN/100 ml					
Fecal Strep. MPN/100 ml					
Iron		0		4.9	
Lead		0		0	
Magnesium		6		17	
Mercury		0.0037		0.035	
Nitrogen - Ammonia					
Nitrogen - Organic					
Nitrogen - Nitrate					
Phosphate-Total, as P					
P.C.B. ppb		0			
Potassium		2.4		2.0	
Sodium		78		98	
Solids - T.D.S.				366	
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate				19	
Temperature** (°C)	22.5	22.0	21.0	22.0	19.0
Volatile Acids					
Zinc		<0.05		0.08	
pH	7.3	7.4	7.3	7.2	7.2

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-12C

GROUNDWATER ANALYSIS
WELL 1

COMPONENT *	SAMPLE DATE 11-8-72	11-30-72	12-19-72	1-10-73	2-6-73
Alkalinity		140			
B.O.D.		<2			
Cadmium		0			
Calcium		16			
C.O.D.		2			
Chloride		108			
Color (Color Units)					
Copper		0.05			
Dissolved Oxygen ppm	4.8	6.3		9.2	7.4
Elect. Cond. µ mhos/cm	500	600		850	320
Fecal Coli. MPN/100 ml		150			
Fecal Strep. MPN/100 ml		460			
Iron		12.9			
Lead		0			
Magnesium		12			
Mercury		0			
Nitrogen - Ammonia		0			
Nitrogen - Organic					
Nitrogen - Nitrate		0.95			
Phosphate-Total, as P					
P.C.B. ppb			0		
Potassium		1.5			
Sodium		70			
Solids - T.D.S.		560			
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate		73			
Temperature** (°C)	19.0	15.0		13.0	12.5
Volatile Acids					
Zinc		0.4			
pH	7.3	7.4		7.2	6.9

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-12D

GROUNDWATER ANALYSIS

WELL 1

COMPONENT *	SAMPLE DATE 3-13-73	6-26-73	9-18-73	12-13-73	5-7-74
Alkalinity	98	130	210	47	84
B.O.D.				4.8	
Cadmium	0	0	0	0	<0.01
Calcium	14	14	27	9	13
C.O.D.	3	9.6	0	6.2	15.6
Chloride	73	50	73	84	18.1
Color (Color Units)					
Copper	0.08	0.06	0.02	0.08	< 0.01
Dissolved Oxygen ppm	12.2	2.6	4.2	7.4	3.8
Elect. Cond. u mhos/cm	380	675	650	250	240
Fecal Coli. MPN/100 ml		< 3.0	-	430	
Fecal Strep. MPN/100 ml		4.0	-	24	
Iron	28	27	0.8	7.2	9.1
Lead	0	0	0	0	< 0.01
Magnesium	18	19	18	10	7
Mercury	0	0.0004		0.0011	< 0.001
Nitrogen - Ammonia		0.1		0	
Nitrogen - Organic		1.3			
Nitrogen - Nitrate		0.8		0.2	
Phosphate-Total, as P					
P.C.B. ppb					
Potassium	2.9	4.0	1.5	1.3	1.4
Sodium	59	73	98	42	24
Solids - T.D.S.	600	960	600	176	180
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate	72	30	16	34	61
Temperature ** (°C)	14.5	35.0	21.6	15.5	17.5
Volatile Acids					
Zinc	0.11	0.76	0.08	0.06	1.2
pH	7.1	7.15	6.7	6.8	6.5

* Units in mg/l unless noted.

** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 Plate H-12E

GROUNDWATER ANALYSIS

WELL 2

	SAMPLE DATE				
COMPONENT *	1-18-72	3-14-72	3-28-72	4-11-72	4-25-72
Temperature** (°C)	14.0	19.0	16.0	17.0	16.0
Alkalinity ($CaCO_3$)	158	142	132	132	140
B.O.D.	1	2		1	
Cadmium	<0.05	0.1		< 0.1	
Calcium	8.3	21		11	
C.O.D.	0	6		11	
Color (Color Units)					
Copper	2.0	.01		< 0.25	
Chloride	25	26	31	19.7	33
Dissolved Oxygen ppm	5.2	6.3	4.7	6.6	6.1
Elect.Cond. μ mhos/cm	400	340	350	320	320
Fecal Coli. MPN/100 ml	3	< 3		< 3	
Fecal Strep. MPN/100 ml					
Lead	< 0.5	<1.0		< 1.0	
Magnesium	40	21		30	
Mercury	0.0004	0.0009		0.00019	
Nitrogen - Ammonia	0.016	0.096		0.0	
Nitrogen - Organic					
Nitrogen - Nitrate	0.38	0.1			0.0
Nitrogen - Nitrite	0.003				
Phosphate-Total, as P					
P.C.B. ppb	0				
Potassium	2.12	11		1.4	
Sodium	38	27		26.2	
Solids - T.D.S.	1372	286	218	272	208
Solids - T.S.S.					
Solids - Settle. ml/l					
Volatile Acids					
Zinc	0.8	0.3		< 0.1	
pH	7.1	7.2	7.0		7.1
Sulphate					

* Units in mg/l unless noted
**Temperature of sample when tested for DO, EC, and pH.

Project 102-1.3 Plate H-13A

GROUNDWATER ANALYSIS

WELL 2

	SAMPLE DATE				
COMPONENT *	5-9-72	5-23-72	6-6-72	7-11-72	7-25-72
Temperature** (°C)	18.0	20.0	19.0	19.0	23.0
Alkalinity ($CaCO_3$)	136	136	130		
B.O.D.			9		
Cadmium	< 0.1		0.12		
Calcium	21		1.5		
C.O.D.	12		22		
Color (Color Units)					
Copper	< 0.2		0.2		
Chloride	23	21	30		
Dissolved Oxygen ppm	6.0	3.8	7.5	4.5	6.2
Elect.Cond. μ mhos/cm	330	360	430	360	400
Fecal Coli. MPN/100 ml	7		< 3		
Fecal Strep. MPN/100 ml					
Lead	< 1.0		0.15		
Magnesium	30		29		
Mercury	0.0062		0.0057		
Nitrogen - Ammonia	0.112		0.160		
Nitrogen - Organic					
Nitrogen - Nitrate	0.09		0.05		
Nitrogen - Nitrite					
Phosphate-Total, as P					
P.C.B. ppb					0
Potassium	1.4		2.1		
Sodium	30		28.5		
Solids - T.D.S.	198	228	158		
Solids - T.S.S.					
Solids - Settle. ml/l					
Volatile Acids					
Zinc	0.1		0.14		
pH	7.3	7.1	7.0	7.0	7.6
Sulphate					

* Units in mg/l unless noted
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 Plate H-13B

GROUNDWATER ANALYSIS
WELL 2

	SAMPLE DATE				
COMPONENT *	8-8-72	9-7-72	10-11-72	11-8-72	11-30-72
Alkalinity		155			150
B.O.D.					<1
Cadmium		0			0
Calcium		20			58
C.O.D.		0			1
Chloride		20			10
Color (Color Units)					
Copper		0			0.03
Dissolved Oxygen ppm	6.1	5.0	4.2	5.2	7.4
Elect. Cond. µ mhos/cm	360	380	370	450	360
Fecal Coli. MPN/100 ml					< 3
Fecal Strep. MPN/100 ml					4.0
Iron		0.4			0.7
Lead		0			0
Magnesium		24			16
Mercury		0.0011			0.0088
Nitrogen - Ammonia					0
Nitrogen - Organic					0
Nitrogen - Nitrate					0.25
Phosphate-Total, as P					
P.C.B. ppb					
Potassium		1.45			0.7
Sodium		44			38
Solids - T.D.S.		212			238
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate		10			8
Temperature** (°C)	20.0	22.5	18.5	19.5	14.0
Volatile Acids					
Zinc		0.08			0.04
pH	7.3	7.1	7.0	7.3	7.4

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-13C

GROUNDWATER ANALYSIS
WELL 2

	SAMPLE DATE				
COMPONENT *	12-19-72	1-10-73	2-6-73	3-13-73	6-26-73
Alkalinity				134	155
B.O.D.					
Cadmium				0	0
Calcium				32	19
C.O.D.				1	10.4
Chloride				48	18
Color (Color Units)					
Copper				0.05	0
Dissolved Oxygen ppm		5.6	6.4	11.5	6.4
Elect. Cond. µ mhos/cm		360	310	450	260
Fecal Coli. MPN/100 ml					3.0
Fecal Strep. MPN/100 ml					4600
Iron				0.3	1.6
Lead				0	0
Magnesium				15	22
Mercury				0.0103	0
Nitrogen - Ammonia					0.3
Nitrogen - Organic					1.1
Nitrogen - Nitrate					0.64
Phosphate-Total, as P					
P.C.B. ppb	0.2				
Potassium				1.0	1.4
Sodium				28	34
Solids - T.D.S.				160	840
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate				10	8
Temperature** (°C)		12.0	12.0	15.0	35.6
Volatile Acids					
Zinc				0.04	0.16
pH		7.2	6.7	7.3	7.1

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-13D

GROUNDWATER ANALYSIS
WELL 2

COMPONENT *	SAMPLE DATE				
	9-18-73	12-13-73	5-7-74		
Alkalinity	164	165	140		
B.O.D.		5.5			
Cadmium	0	0	<0.01		
Calcium	22	47	41		
C.O.D.	0	10.1	0.8		
Chloride		54	20.7		
Color (Color Units)					
Copper	0.03	0.05	<0.01		
Dissolved Oxygen ppm	-	4.4	3.4		
Elect. Cond. µ mhos/cm	320	360	380		
Fecal Coli. MPN/100 ml	-	230			
Fecal Strep. MPN/100 ml	-	9			
Iron	0.3	0.3	0.38		
Lead	0	0	<0.01		
Magnesium	18	19	25.6		
Mercury		0	0.0015		
Nitrogen - Ammonia		0			
Nitrogen - Organic					
Nitrogen - Nitrate		0.11			
Phosphate-Total, as P					
P.C.B. ppb					
Potassium	0.9	0.8	0.96		
Sodium	38	42	24		
Solids - T.D.S.	120	268	401		
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate	21	24	69		
Temperature** (°C)	22.5	16.0	18.0		
Volatile Acids					
Zinc	0.04	0.04	1.0		
pH	6.7	6.7	6.6		

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 Plate H-13E

GROUNDWATER ANALYSIS

WELL 3

	SAMPLE DATE				
COMPONENT *	1-18-72	3-2-72	3-14-72	3-28-72	4-11-72
Temperature** (°C)	12.0	15.0	20.5	16.0	17.0
Alkalinity ($CaCO_3$)	118	78	116	112	118
B.O.D.	9	2			2
Cadmium	< 0.05	< 0.1			< 0.1
Calcium	40	26			21
C.O.D.	0	126			5
Color (Color Units)					
Copper	< 0.2	< 0.2			< 0.25
Chloride	13	10	43	24	13.3
Dissolved Oxygen ppm	6.0	6.6	5.0	6.8	6.4
Elect.Cond. μ mhos/cm	350	250	330	320	300
Fecal Coli. MPN/100 ml	4	930			< 3
Fecal Strep.MPN/100 ml					
Lead	< 0.5	< 0.5			< 1.0
Magnesium	30	20			17
Mercury	0.0004	0.0012			0.0015
Nitrogen - Ammonia	0.016	0.048			0.04
Nitrogen - Organic					
Nitrogen - Nitrate	2.25	2.00			2.19
Nitrogen - Nitrite	0.003				
Phosphate -Total, as P					
P.C.B. ppb	0				
Potassium	1.88	1.9			1.7
Sodium	14.5	14.0			13.5
Solids - T.D.S.	276	304	108	214	672
Solids - T.S.S.					
Solids - Settle. ml/l					
Volatile Acids					
Zinc	0.3	.05			< 0.1
pH	7.4	7.2	7.2	7.1	
Sulphate		17.2			

* Units in mg/l unless noted
** Temperature of sample when tested for DO, EC, and pH.

Project 102-1.3

Plate H-14 A

GROUNDWATER ANALYSIS

WELL 3

	SAMPLE DATE				
COMPONENT *	4-25-72	5-9-72	5-23-72	6-6-72	7-11-72
Temperature** (°C)	16.0	19.5	19.0	18.0	22.5
Alkalinity ($CaCO_3$)	122	146	106	102	
B.O.D.		2		5	
Cadmium		< 0.1		0.15	
Calcium		24		2.1	
C.O.D.		331		38	
Color (Color Units)					
Copper		< 0.2		0.25	
Chloride	31	13	12	19	
Dissolved Oxygen ppm	6.3	7.2	3.9	6.2	6.2
Elect.Cond. μ mhos/cm	320	300	300	300	310
Fecal Coli. MPN/100 ml		460		43	
Fecal Strep.MPN/100 ml					
Lead		< 1.0		0.20	
Magnesium		20		54	
Mercury		0.0048		0.0027	
Nitrogen - Ammonia		0.088		0	
Nitrogen - Organic					
Nitrogen - Nitrate		1.52		2.60	
Nitrogen - Nitrite					
Phosphate-Total, as P					
P.C.B. ppb					
Potassium		1.5		2.6	
Sodium		15		13.8	
Solids - T.D.S.	202	366	214	278	
Solids - T.S.S.					
Solids - Settle. ml/l					
Volatile Acids					
Zinc		0.1		0.22	
pH	7.2	7.3	7.1	7.2	7.1
Sulphate					

* Units in mg/l unless noted
** Temperature of sample when tested for DO, EC, and pH.

Project 102-1.3

Plate H-14B

GROUNDWATER ANALYSIS

WELL 3

COMPONENT *	SAMPLE DATE 7-25-72	8-8-72	9-7-72	10-11-72	11-8-72
Alkalinity			120		
B.O.D.					
Cadmium			0		
Calcium			30		
C.O.D.			0		
Chloride			10		
Color (Color Units)					
Copper			0		
Dissolved Oxygen ppm	6.2	6.7	4.6	4.7	5.0
Elect. Cond. μ mhos/cm	400	300	300	310	350
Fecal Coli. MPN/100 ml					
Fecal Strep. MPN/100 ml					
Iron			0.6		
Lead			0		
Magnesium			19		
Mercury			0.0009		
Nitrogen - Ammonia					
Nitrogen - Organic					
Nitrogen - Nitrate					
Phosphate-Total, as P					
P.C.B. ppb	0				
Potassium			1.55		
Sodium			33		
Solids - T.D.S.			178		
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate			15		
Temperature** (°C)	22.0	20.0	22.0	19.0	20.0
Volatile Acids					
Zinc			0.06		
pH	7.5	7.4	7.1	7.2	7.2

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-14C

GROUNDWATER ANALYSIS

WELL 3

COMPONENT *	SAMPLE DATE 11-30-72	12-19-72	1-10-73	2-6-73	3-13-73
Alkalinity	110				150
B.O.D.	<1				
Cadmium	0				0
Calcium	50				40
C.O.D.	1				0
Chloride	24				29
Color (Color Units)					
Copper	0.03				0.05
Dissolved Oxygen ppm	7.6		7.4	4.8	11.2
Elect. Cond. μ mhos/cm	300		350	360	350
Fecal Coli. MPN/100 ml	23.0				
Fecal Strep. MPN/100 ml	93.0				
Iron	0.4				0.2
Lead	0				0
Magnesium	15				25
Mercury	0.00165				0.154
Nitrogen - Ammonia	0				
Nitrogen - Organic	0				
Nitrogen - Nitrate	4.50				
Phosphate-Total, as P					
P.C.B. ppb		0			
Potassium	0.5				0.8
Sodium	20				32
Solids - T.D.S.	210				160
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate	18				27
Temperature** (°C)	14.0		12.0	12.0	15.0
Volatile Acids					
Zinc	0.04				0.07
pH	7.2		7.2	6.7	7.3

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-14D

GROUNDWATER ANALYSIS
WELL 3

COMPONENT *	SAMPLE DATE 7-17-73	9-18-73	12-13-73	5-7-74	
Alkalinity	109	116	118	121	
B.O.D.	<7.6		<1.5		
Cadmium	0	0	0	<0.01	
Calcium	37	32	30	35	
C.O.D.	7.8	3.1	2.3	13.5	
Chloride			58	5.17	
Color (Color Units)					
Copper	0.06	0	0.05	< 0.01	
Dissolved Oxygen ppm	2.9	6.7	4.7	6.2	
Elect. Cond. μ mhos/cm	380	260	300	260	
Fecal Coli. MPN/100 ml	43	-	15		
Fecal Strep. MPN/100 ml	930	-	75		
Iron	5.9	0.2	1.2	2.24	
Lead	0	0	0	<0.01	
Magnesium	16	13	13	20	
Mercury	0.0019		0.0008	0.0015	
Nitrogen - Ammonia	0		0		
Nitrogen - Organic	0.8				
Nitrogen - Nitrate	2.35		3.8		
Phosphate-Total, as P					
P.C.B. ppb					
Potassium	1.6	1.3	1.2	1.04	
Sodium	24	24	10	11.0	
Solids - T.D.S.	268	240	220	214	
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate	21.0	33.0	31	59	
Temperature** (°C)	21.0	22.0	15.5	17.5	
Volatile Acids					
Zinc	0.15	0.06	0.04	0.76	
pH	7.3	6.6	6.8	6.7	

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-14E

GROUNDWATER ANALYSIS

WELL 4

	SAMPLE DATE				
COMPONENT *	1-18-72	3-14-72	3-28-72	4-11-72	4-25-72
Temperature ** (°C)	12.0	19.5	18.0	16.0	17.0
Alkalinity ($CaCO_3$)	106	118	114	122	132
B.O.D.	10	3		2	
Cadmium	< 0.05	< 0.1		< 0.1	
Calcium	200	30		20	
C.O.D.	0	28		11	
Color (Color Units)					
Copper	1.2	<.01		< 0.25	
Chloride	27	30	24	16.7	28
Dissolved Oxygen ppm	5.5	6.0	4.3	5.9	4.8
Elect.Cond. μ mhos/cm	300	320	300	300	250
Fecal Coli. MPN/100 ml	43	< 3		< 3	
Fecal Strep. MPN/100 ml					
Lead	< 0.5	<1.0		< 1.0	
Magnesium	300	30		35	
Mercury	0.0006	0.0012		0.0033	
Nitrogen - Ammonia	0.16	0.232		0.0	
Nitrogen - Organic					
Nitrogen - Nitrate	0.08	0.3		0.0	
Nitrogen - Nitrite	0.010				
Phosphate-Total, as P					
P.C.B. ppb	0				
Potassium	2.10	14		1.9	
Sodium	13.0	18.5		16.6	
Solids - T.D.S.	240	262	214	404	248
Solids - T.S.S.					
Solids - Settle. ml/l					
Volatile Acids					
Zinc	0.2	1.1		< 0.1	
pH	6.8	6.7	6.4		6.6
Sulphate					

* Units in mg/l unless noted
** Temperature of sample when tested for DO, EC, and pH

Project 102-1.3

Plate H-15 A

GROUNDWATER ANALYSIS

WELL 4

	SAMPLE DATE				
COMPONENT *	5-9-72	5-23-72	6-6-72	7-11-72	7-25-72
Temperature ** (°C)	19.0	18.0		21.0	19.0
Alkalinity ($CaCO_3$)	140	120	118		
B.O.D.	2		7		
Cadmium	< 0.1		0.18		
Calcium	25		2.8		
C.O.D.	12		38		
Color (Color Units)					
Copper	< 0.2		0.55		
Chloride	25	15	22		
Dissolved Oxygen ppm	5.0	4.0	3.2	5.5	4.0
Elect.Cond. μ mhos/cm		300	310	240	400
Fecal Coli. MPN/100 ml	9		< 3		
Fecal Strep. MPN/100 ml					
Lead	< 1.0		0.20		
Magnesium			90		
Mercury	0.027		0.0090		
Nitrogen - Ammonia	0.112		0.208		
Nitrogen - Organic					
Nitrogen - Nitrate	0.16		0.33		
Nitrogen - Nitrite					
Phosphate-Total, as P					
P.C.B. ppb					0
Potassium	1.9		2.6		
Sodium	24		18		
Solids - T.D.S.	202	256	328		
Solids - T.S.S.					
Solids - Settle. ml/l					
Volatile Acids					
Zinc	0.2		0.34		
pH	6.6	6.7	6.8	6.9	7.3
Sulphate					

* Units in mg/l unless noted
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3

Plate H-15B

GROUNDWATER ANALYSIS
WELL 4

	SAMPLE DATE				
COMPONENT *	8-8-72	9-7-72	12-19-72	3-27-73	7-17-73
Alkalinity		135	130	100	109
B.O.D.			0		<4.4
Cadmium		0	<0.1	0	0
Calcium		32	26	32	32
C.O.D.		0	0	1	6.2
Chloride		10	22	13	14
Color (Color Units)					
Copper		0	0.02	0.06	0.05
Dissolved Oxygen ppm	6.0	5.0	4.4	5.6	1.2
Elect. Cond. µ mhos/cm	310	300	330	380	320
Fecal Coli. MPN/100 ml			<3.0		<3.0
Fecal Strep. MPN/100 ml			43.0		<3.0
Iron		1.1	1.8	1.65	4.9
Lead		0	0	0	0
Magnesium		15	17.5	21	15
Mercury		0.0029	0.0086	0	
Nitrogen - Ammonia			0		0
Nitrogen - Organic			0		0.8
Nitrogen - Nitrate			0.1		0.38
Phosphate-Total, as P					
P.C.B. ppb			0		
Potassium		1.60	1.16	1.2	1.1
Sodium		28	28	17.5	25.0
Solids - T.D.S.		186	288	280	288
Solids - T.S.S.			23		
Solids - Settle. ml/l					
Sulphate		18	73	35	74
Temperature** (°C)	18.0	22.0	16.0	17.5	19.8
Volatile Acids					
Zinc		0.04	0.06	0.05	0.12
pH	6.6	6.6	6.9	6.4	6.9

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

GROUNDWATER ANALYSIS
WELL 4

	SAMPLE DATE				
COMPONENT *	9-18-73	12-13-73	5-7-74		
Alkalinity	130	118	112		
B.O.D.		<1			
Cadmium	0	0	0.012		
Calcium	27	51	74		
C.O.D.	3.9	1.5	22.2		
Chloride	13	56	10.3		
Color (Color Units)					
Copper	0.03	0.08	<0.01		
Dissolved Oxygen ppm	4.6	5.8	3.5		
Elect. Cond. µ mhos/cm	260	400	400		
Fecal Coli. MPN/100 ml	-	9			
Fecal Strep. MPN/100 ml	-	430			
Iron	0.6	0.1	0.84		
Lead	0	0	<0.01		
Magnesium	16	23	25.6		
Mercury		0.0019	0.0018		
Nitrogen - Ammonia		0.6			
Nitrogen - Organic					
Nitrogen - Nitrate		5.5			
Phosphate-Total, as P					
P.C.B. ppb					
Potassium	1.2	1.2	1.96		
Sodium	22	18	23.2		
Solids - T.D.S.	280	348	341		
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate	33	82	102		
Temperature** (°C)	20.0	17.0	19.0		
Volatile Acids					
Zinc	0.03	0.04	1.34		
pH	6.3	6.4	6.3		

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

WATER ANALYSIS REPORT

COOK RESEARCH LABORATORIES INC

PH. (415) 368-3329
EDISON WAY AT 11TH AVENUE

WATER, WASTE WATER AND AIR POLLUTION
CHEMISTS AND ENGINEERS

ESTABLISHED 1927

P. O. BOX 2266
MENLO PARK, CALIF. 94025

LABORATORY FACILITIES FOR ALL
"STANDARD METHODS" TESTS

REPORT TO
Terratech, Inc.
193 E. Gish Road
San Jose, California 95112

SOURCE OF SAMPLE Hammel

DATE REC'D 5/25

DATE REPORTED 6/2/70

ANIONS	MILLIGRAMS PER LITER	EQUIVALENTS PER MILLION	DETERMINATION	MILLIGRAMS PER LITER	DETERMINATION	MILLIGRAMS PER LITER
Nitrate (NO_3)	2.8	0.04	Phenolphthalein Alkalinity ($CaCO_3$)	0.0	Silica (SiO_2)	20
Chloride (Cl)	38.	1.07	Methyl Orange Alkalinity ($CaCO_3$)	148	Iron (Fe)	0.77
Sulphate (SO_4)	11.	0.23	Total Hardness ($CaCO_3$)	164	Manganese (Mn)	0.03
Bicarbonate (HCO_3)	181.	3.00	Calcium Hardness ($CaCO_3$)	60	Boron (B)	0.1
Carbonate (CO_3)	0.0	0.00	Magnesium Hardness ($CaCO_3$)	104	Fluoride (F)	0.33
Phosphate (PO_4)	0.1	0.00	Total Solids - Calculated	233		
Total Equivalents Per Million		4.34	Total Solids - Evaporation	245		
CATIONS	MILLIGRAMS PER LITER	EQUIVALENTS PER MILLION	Loss On Ignition			
Sodium (Na)	20.	0.87	Total Fixed Residue			
Potassium (K)	0.40	0.01				
Calcium (Ca)	24.	1.20				
Magnesium (Mg)	25.	2.06				
Total Equivalents Per Million		4.14	Sp. Cond. - Micromhos 25°C	346	Hyd. Ion Conc. (pH)	7.24

THIS IS AN APPROVED COMMERCIAL WATER LABORATORY DESIGNATED BY THE STATE OF CALIFORNIA DEPARTMENT OF PUBLIC HEALTH

COMMENTS:

ORIGINAL GEOTECHNICAL INVESTIGATION

Reported by Philip H. Harten

PLATE H-16A

FORM C 9/68

GROUNDWATER ANALYSIS

CELL A & E SUBDRAIN

	SAMPLE DATE				
COMPONENT *	12-8-71	1-7-72	2-15-72	3-14-72	3-28-72
Temperature** (°C)		15.0	16.5	17.5	16.0
Alkalinity ($CaCO_3$)	116				
B.O.D.	0				
Cadmium					
Calcium	10				
C.O.D.	4				
Color (Color Units)	5				
Copper					
Chloride	23				
Dissolved Oxygen ppm		4.4	5.5	4.3	4.9
Elect.Cond. µ mhos/cm		400	320	340	300
Fecal Coli. MPN/100 ml					
Fecal Strep. MPN/100 ml					
Lead					
Magnesium	22				
Mercury					
Nitrogen - Ammonia					
Nitrogen - Organic					
Nitrogen - Nitrate					
Nitrogen - Nitrite					
Phosphate-Total, as P					
P.C.B. ppb					
Potassium					
Sodium					
Solids - T.D.S.	216				
Solids - T.S.S.					
Solids - Settle. ml/l					
Volatile Acids					
Zinc					
pH	5.6	5.8	5.5	5.4	5.5
Sulphate					

* Units in mg/l unless noted

** Temperature of sample when tested for DO, EC, and pH.

Project 102-1.3

Plate H-17A

GROUNDWATER ANALYSIS

CELL A & E SUBDRAIN

	SAMPLE DATE				
COMPONENT *	4-25-72	5-23-72	6-6-72	6-20-72	7-11-72
Temperature** (°C)	17.0	17.0		18.5	20.5
Alkalinity ($CaCO_3$)					
B.O.D.					
Cadmium					
Calcium					
C.O.D.					
Color (Color Units)					
Copper					
Chloride					
Dissolved Oxygen ppm	5.9	4.9	7.6	5.2	5.5
Elect.Cond. µ mhos/cm	350	350	360	320	350
Fecal Coli. MPN/100 ml					
Fecal Strep. MPN/100 ml					
Lead					
Magnesium					
Mercury					
Nitrogen - Ammonia					
Nitrogen - Organic					
Nitrogen - Nitrate					
Nitrogen - Nitrite					
Phosphate-Total, as P					
P.C.B. ppb					
Potassium					
Sodium					
Solids - T.D.S.					
Solids - T.S.S.					
Solids - Settle. ml/l					
Volatile Acids					
Zinc					
pH	5.5	5.7	5.9	6.7	5.7
Sulphate					

* Units in mg/l unless noted

**Temperature of sample when tested for DO, EC, and pH.

Project 102-1.3

Plate H-17B

GROUNDWATER ANALYSIS
CELL A & E SUBDRAIN

COMPONENT *	SAMPLE DATE 9-7-72	11-30-72	1-10-73	3-27-73	12-13-73
Alkalinity	140	130		150	147
B.O.D.		0			<1
Cadmium	0	0		0	0
Calcium	38	56		46	47
C.O.D.	8.7	0		1	0.8
Chloride	11	13		18	54
Color (Color Units)		4			
Copper	0	0.02		0.06	0.05
Dissolved Oxygen ppm	7.0	5.6	9.4	6.0	5.4
Elect. Cond. µ mhos/cm	825	450	700	420	320
Fecal Coli. MPN/100 ml		<3			<3
Fecal Strep. MPN/100 ml		<3			<3
Iron	0.1	0.4		0.13	0.5
Lead	0	0		0	0
Magnesium	12	16		13	19
Mercury	0.0025	0.0165			0.0002
Nitrogen - Ammonia		0			0
Nitrogen - Organic		0			
Nitrogen - Nitrate		1.67			2.1
Phosphate-Total, as P					
P.C.B. ppb		0			
Potassium	0.70	0.9		1.1	1.0
Sodium	30	22		30	54
Solids - T.D.S.	186	330		220	244
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate	15	16		14	27
Temperature** (°C)	23.5	15.0	9.0	16.0	18.0
Volatile Acids					
Zinc	0.05	0.03		0.06	0.03
pH	6.1	5.9	7.6	6.0	6.7

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 Plate H-17C

GROUNDWATER ANALYSIS
CELL A & E SUBDRAIN

COMPONENT *	SAMPLE DATE 6-19-74				
Alkalinity	132				
B.O.D.	0.5				
Cadmium	< 0.01				
Calcium	58				
C.O.D.	0				
Chloride	12				
Color (Color Units)					
Copper	< 0.02				
Dissolved Oxygen ppm	5.9				
Elect. Cond. µ mhos/cm	400				
Fecal Coli. MPN/100 ml					
Fecal Strep. MPN/100 ml					
Iron	0.28				
Lead	0.07				
Magnesium	19.1				
Mercury	0.0009				
Nitrogen - Ammonia	0				
Nitrogen - Organic	0				
Nitrogen - Nitrate	2.0				
Phosphate-Total, as P					
P.C.B. ppb					
Potassium	0.7				
Sodium	16.7				
Solids - T.D.S.	221				
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate					
Temperature** (°C)	20.0				
Volatile Acids					
Zinc	0.70				
pH	6.6				

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Project 102-1.3 Plate H-17D

OBSERVATION WELLS AND PIEZOMETERS

Depth to Water Level - Feet

DATE	WELLS				PIEZOMETERS					
	1	2	3	4	1	2	3	4	5	6
1-18-72	6.5	7.0	8.5	18.5	10.0	1.0	None			
3-2-72	6.0	8.0	7.0	19.0						
3-14-72	5.5	6.6	6.4	18.5	5.9	1.0	7.7			
3-28-72	5.7	7.2	6.5	18.5						
4-11-72	5.5	7.1	6.3	18.7	4.6	1.4	5.4			
4-25-72	5.7	7.3	6.2	18.9						
5-9-72	5.7	7.4	6.4	18.9	3.6	1.7	4.0			
5-23-72	5.8	7.5	6.6	19.0						
6-6-72	5.7	7.6	5.8	19.1						
7-11-72	6.0	8.1	7.7	19.3	2.3	1.5	2.3			
7-25-72	-	-	-		2.4	1.9	2.4			
8-8-72	6.1	8.1	8.4	19.4	-	-	-			
9-7-72	6.1	8.2	9.1	19.5	2.2	1.9	2.1			
10-11-72	6.4	8.1	9.7							
11-8-72	6.1	6.3	6.9							
11-30-72	5.9	6.4	4.7							
12-19-73				17.0	1.8	0.3	1.8			
1-10-73	4.7	4.2	3.8							
2-6-73	4.1	3.3	2.4							
3-13-73	2.8	3.8	3.8							
3-27-73	-	-	-	14.1	0.8	0.0	0.9			
4-10-73	2.7	3.6	3.8							
5-15-73	3.6	4.2	3.1							
6-26-73	3.9	7.4			0.7	0.0	0.5			
7-17-73			7.1	18.8						
8-7-73	4.3	7.9	7.6							
9-18-73	5.6	8.4	8.4	18.5	1.6	2.5	3.2			
12-11-73	2.6	4.6	3.6	14.0	1.3	1.0	0.7			
1-22-74	1.0	2.3	3.5							
3-6-74	1.0	2.0	3.5							
4-17-74	1.5	4.0	3.7	14.2						
5-7-74	2.8	5.2	5.6	18.6	0.8	0.9	1.2			

CUMULATIVE LEACHATE PRODUCTION

Date	(1) Cell A - Gallons	(2) Cell B - Gallons	(3) Cell E - Gallons
12-7-71	-	830	-
12-15-71	Tr	833	Tr
12-19-71	Tr	834	0.1
12-28-71	Tr	837	0.1
1-3-72	Tr	838	0.3
1-11-72	Tr	838	0.7
1-18-72	Tr	838	0.9
2-15-72	0.3	838	1.9
3-2-72	0.3	838	2.1
3-14-72	0.3	838	2.2
3-28-72	0.3	838	2.2
4-11-72	0.3	838	2.2
4-25-72	0.3	838	2.2
9-7-72	0.8	-	-
10-15-72	30.8	898	-
10-17-72	50.8	958	17.2
10-18-72	--	1018	-
10-19-72	80.8	1083	22.2
10-20-72	80.8	1093	22.2
10-21-72	80.8	1153	22.2
10-24-72	81.8	1164	23.7
11-8-72	81.8	1164	46.2
11-27-72	81.8	1164	71.2
12-6-72	81.8	1164	81.2
12-11-72	81.8	1164	96.2
12-18-72	81.8	1164	116.2
12-21-72	84.3	1164.5	116.7

(1) An estimated 1710 gallons of rainwater added to Cell A during construction.

(2) An estimated 7268 gallons of rainwater and 34,000 gallons of additional water added to Cell B to obtain field capacity.

(3) An estimated 7420 gallons of rainwater and 27,000 gallons of septic tank pumpings added to Cell E during construction.

COUNTY OF SONOMA PLATE H-19A

CUMULATIVE LEACHATE PRODUCTION

Date	(1) Cell A - Gallons	(2) Cell B - Gallons	(3) Cell E - Gallons
12-26-72	84.3	1164.5	146.7
1-4-73	114.3	1164.5	241.7
1-11-73	114.3	1164.5	341.7
1-18-73	119.3	1164.5	459.7
1-26-73	135.3	1165	590.2
2-1-73	140.3	1165	782.2
2-8-73	140.3	1165	980.2
2-15-73	140.3	1165	1171.2
2-22-73	145.8	1170.5	1352.7
3-1-73	145.8	1170.5	1490.7
3-8-73	145.8	1170.5	1632.7
3-15-73	145.8	1170.5	1753.7
3-22-73	145.8	1170.5	1775.7
3-29-73	145.8	1170.5	1874.7
4-5-73	145.8	1170.5	1959.7
4-12-73	145.8	1170.5	2041.7
4-19-73	145.8	1170.5	2120.7
4-26-73	146.0	1171.0	2189.2
5-3-73	146.0	1171.0	2253.2
5-10-73	146.0	1171.0	2314.2
5-17-73	146.0	1171.0	2368.2
5-24-73	146.5	1171.0	2417.7
5-31-73	146.5	1171.0	2465.7
6-7-73	146.5	1171.0	2414.7
6-14-73	146.5	1171.0	2464.7
6-21-73	146.5	1171.0	2505.7
6-28-73	146.5	1171.0	2548.7

COUNTY OF SONOMA PLATE H-19B

CUMULATIVE LEACHATE PRODUCTION

Date	(1) Cell A - Gallons	(2) Cell B - Gallons	(3) Cell E - Gallons
7-5-73	146.5	1171.0	2583.2
7-12-73	148.5	1171.0	2623.2
7-19-73	148.5	1171.0	2670.2
7-26-73	148.5	1171.0	2708.7
8-2-73	148.5	1171.0	2748.7
8-9-73	148.5	1171.0	2789.7
8-16-73	148.5	1171.0	2823.7
8-23-73	148.5	1171.0	2859.7
8-30-73	148.5	1171.0	2896.7
9-6-73	148.5	1171.0	2935.7
9-14-73	148.5	1171.0	2984.7
9-21-73	148.5	1171.0	3021.7
9-28-73	148.5	1171.0	3051.7
10-5-73	148.5	1171.0	3090.7
10-12-73	148.5	1171.0	3122.7
10-19-73	148.5	1171.0	3152.7
10-26-73	148.5	1171.0	3182.7
11-2-73	148.5	1171.0	3204.2
11-9-73	183.5	1206.0	3238.5
11-16-73	443.5	3550	3350.5
11-23-73	667	4660	3700
11-30-73	771	5000	4117
12-7-73	924	5350	4514
12-14-73	1008	5625	4871
12-21-73	1108	5800	5183
12-28-73	1213	5975	5508
1-4-74	1363	6225	5917

COUNTY OF SONOMA PLATE H-19 C

CUMULATIVE LEACHATE PRODUCTION

Date	(1) Cell A - Gallons	(2) Cell B - Gallons	(3) Cell E - Gallons
1-11-74	1513	6475	6267
1-18-74	1713	6775	6720
1-30-74	1917	7500	7200
2-8-74	2017	7610	7400
2-15-74	2057	7660	7600
2-22-74	2092	7730	7840
3-4-74	2167	7820	7990
3-8-74	2207	7880	8090
3-15-74	2287	7980	8240
3-22-74	2337	8050	8481
3-29-74	2437	8200	8681
4-3-74	2527	8350	8880
4-12-74	2617	8500	9240
4-19-74	2677	8560	9465
4-26-74	2740	8660	9644
5-3-74	2780	8660	9800
5-10-74	2814	8660	9934
5-20-74	2882	8660	10098
5-24-74	2912	8660	10160
5-31-74	2952	8660	10254
6-7-74	2982	8660	10341
6-14-74	3010	8660	10417
6-20-74	3042	8660	10479
6-27-74	3066	8660	10547
7-5-74	3091	8660	10622

COUNTY OF SONOMA PLATE H-19 D

LYSIMETER SAMPLE FIELD ANALYSIS

Lysimeter Location	Date	Volume ml	pH	D.O.* ppm	E.C. µ mhos/cm
Cell A - 4 feet below bottom of Cell	1-18-72	200	5.6	5.0	380
	2-15-72	30	7.1	8.4	-
	3-14-72	30	7.1	7.8	-
	5-23-72	70	6.5	9.0	-
	6-20-72	50	8.4	-	-
	9-20-72	30	5.9	9.0	-
	12-19-72	50	6.5	-	-**
	4-10-73	blocked	-	-	-
	7-17-73	52	5.9	2.4	290
	12-13-73	40	5.9	5.8	140
Cell A - 8 feet below bottom of Cell	1-18-72	400	5.7	1.3	310
	2-15-72	200	7.0	9.3	-
	3-14-72	50	7.4	8.1	-
	5-23-72	240	6.9	10.0	-
	6-20-72	250	7.3	9.2	160
	9-20-72	400	6.4	9.6	275
	12-19-72	150	6.8	10.2	300
	4-10-73	0	-	-	-
	7-17-73	91	6.7	4.0	400
	9-18-73	100	-	-	240
	12-13-73	300	6.0	8.2	300
Cell E - 8 feet below bottom of Cell	12-15-71	50	7.4	-	-
	1-18-72	300	6.6	5.9	290
	2-15-72	35	7.4	8.7	-
	3-14-72	50	6.9	8.0	-
	5-23-72	35	7.1	10.4	-
	6-20-72	50	8.3	-	-
	9-20-72	30	7.2	8.9	-
	12-19-72	50	7.0	-	-**
	4-10-73	blocked	-	-	-
	7-17-73	blocked	-	-	-

* Water samples are collected from lysimeters by displacing the sample with air from a pressurized tank. This procedure thoroughly aerates the sample.

** Insufficient quantity for D.O. or E.C. tests.

RAINFALL, EVAPORATION AND RUNOFF

NOV. 1971	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12	0.29					
13	0.25					
14						
15						
16	0.02					
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29	0.96					
30						
TOTALS	1.52					

Evaporation reported in Inches

REMARKS

No Evaporation or runoff data was taken for this month.

COUNTY OF SONOMA

PLATE H-23 A

RAINFALL, EVAPORATION AND RUNOFF

DEC. 1971	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1						
2	0.50					
3	0.32					
4						
5						
6	0.24					
7						
8						
9	0.27					
10	0.09					
11	0.03					
12						
13	0.77					
14						
15	0.05					
16						
17						
18						
19						
20						
21						
22	0.51					
23	0.22					
24	0.06					
25						
26						
27	1.77					
28						
29	0.03					
30						
31						
TOTALS	4.86					

Evaporation reported in Inches

REMARKS

No evaporation or runoff data was taken for this month.

COUNTY OF SONOMA

PLATE H-23 B

RAINFALL, EVAPCRATION AND RUNOFF

JAN. 1972	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20	0.13					
21	0.09					
22	0.11					
23						
24	0.25					
25	0.28					
26	0.01					
27	0.58					
28	0.03					
29						
30						
31						
TOTALS	1.48					

Evaporation reported in Inches

REMARKS

No evaporation or runoff data was taken for this month.

COUNTY OF SONOMA

PLATE H-23C

RAINFALL, EVAPCRATION AND RUNOFF

FEB. 1972	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1						
2	0.50					
3	0.84					
4						
5						
6						
7	1.30					
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22	0.39					
23	0.02					
24	0.03					
25						
26						
27						
28	0.08					
29	0.15					
30						
TOTALS	3.31					

Evaporation reported in Inches

REMARKS

No evaporation or runoff data was taken for this month.

COUNTY OF SONOMA

PLATE H-23D

RAINFALL, EVAPCRATION AND RUNOFF

MARCH 1972	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1		.160	732		420	
2	0.10	.128				
3	0.08	.032				
4		.077				
5		.077				
6		.192				
7		.077				
8		.160				
9		.064				
10	0.05	.128				
11		.128				
12		.077				
13		.064				
14		.128				
15		.128				
16		.192				
17		.064				
18		.077				
19		.077				
20		.064				
21		.064				
22		.077				
23		.077				
24		.077				
25	0.25	.064	732	0	420	0
26		.288				
27		.160				
28		.064				
29		.064				
30		.160				
31		.064				
TOTALS	0.48	3.253		0		0

Evaporation reported in Inches

REMARKS

Evaporation and runoff meters were operational as of March 1st.

Runoff meter readings are the initial readings after testing.

COUNTY OF SONOMA

PLATE H-23 E

RAINFALL, EVAPCRATION AND RUNOFF

APRIL 1972	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1		.064				
2		.128				
3		.077				
4		.192				
5	0.15	.077	732	0	420	0
6	0.15	.128	732	0	420	0
7		.064				
8		.160				
9		.160				
10		.160				
11	0.58	.160	732	0	420	0
12		.160				
13	0.26	.160	732	0	420	0
14		.160				
15		.160				
16		.160				
17		.160				
18		.256				
19		.256				
20		.256				
21		.256				
22		.256				
23	0.22	.256	732	0	549*	0
24		.256				
25		.256				
26		.256				
27		.256				
28		.256				
29		**				
30		**				
31		**				
TOTALS	1.36	5.146		0		0

Evaporation reported in Inches

REMARKS

* Ran flow test on drainage meter. This flow was not due to rainfall runoff.

** Evaporation gage was being repaired and was not available for recording on these dates.

COUNTY OF SONOMA

PLATE H-23 F

RAINFALL, EVAPORATION AND RUNOFF

MAY 1972	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1		*	732	0	549	0
2		*				
3		*				
4		*				
5		*				
6		*				
7		*				
8		*				
9		*				
10		.128				
11		.256				
12		.288				
13		.288				
14		.256				
15		.128				
16		.128				
17		.160				
18		.160				
19		.192				
20		.128				
21		.160				
22		.077				
23		.224				
24		.077				
25		.128				
26		.077				
27		.064				
28		.064				
29		.256				
30		.160				
31		.160				
TOTALS	0.00	3.559		0		0

Evaporation reported in Inches

REMARKS

* Evaporation gage was being repaired and was not available for recording on these dates.

COUNTY OF SONOMA

PLATE H-23G

RAINFALL, EVAPORATION AND RUNOFF

JUNE 1972	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1		.192				
2		.160				
3		.128				
4		.128				
5		.352				
6		.160				
7		.160				
8		.160				
9	.19	.064	732	0	549	0
10		.128				
11		.256				
12		.288				
13		.192				
14		.224				
15		.256				
16		.256				
17		.224				
18		.192				
19		.128				
20		.192				
21		.077				
22		.128				
23		.128				
24		.256				
25		.160				
26		.077				
27		.160				
28		.128				
29		.077				
30		.256	732	0	549	0
TOTALS	0.19	5.287		0		0

Evaporation reported in Inches

REMARKS

COUNTY OF SONOMA

PLATE H-23 H

RAINFALL, EVAPORATION AND RUNOFF

JULY 1972	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1		.397	732	0	549	0
2		.160				
3		.192				
4		.192				
5		.192				
6		.077				
7		.160				
8		.160				
9		.320				
10		.800				
11		.397				
12		.512				
13		.768				
14		.896				
15		.576				
16		.320				
17		.224				
18		.256				
19		.128				
20		.128				
21		.160				
22		.160				
23		.064				
24		.192				
25		.160				
26		.192				
27		.320				
28		.192				
29		.160				
30		.128				
31		.224				
TOTALS	0.00	9.111		0		0

Evaporation reported in Inches

REMARKS

COUNTY OF SONOMA

PLATE H-23 I

RAINFALL, EVAPORATION AND RUNOFF

AUG. 1972	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1		.288				
2		.192				
3		.128				
4		.160				
5		.320				
6		.192				
7		.224				
8		.224				
9		.160				
10		.128				
11		.128				
12		.320				
13		.320				
14		.205	763*	0	783*	0
15		.192				
16	TR	.077				
17		.224				
18		.160				
19		.077				
20		.192				
21		.224				
22		.288	1168*	0	1569*	0
23		.256				
24		.352				
25		.384				
26		.192				
27		.192				
28		.192				
29		.128				
30		.192				
31		.128				
TOTALS	TR	6.439		0		0

Evaporation reported in Inches

REMARKS

* Meter Flow due to Testing and Adjusting

COUNTY OF SONOMA

PLATE H-23 J

RAINFALL, EVAPCRATION AND RUNOFF

SEPT. 1972	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1		.128				
2		.128				
3		.320				
4		.192				
5		.160				
6		.224				
7		.077				
8		.160				
9		.160				
10		.384				
11		.160				
12		.192				
13		.160				
14		.064				
15		.077				
16		.128				
17		.192				
18		.224				
19		.224				
20		.320				
21		.288				
22		.288				
23		.320				
24		.384				
25		.128				
26	.52	.064	1168*	0	1569*	0
27	.11	.064				
28		.160				
29		.288				
30		.077				
TOTALS	0.63	2.829		0		0

Evaporation reported in Inches

REMARKS

* No visable runoff from test cell area due to this rain.

COUNTY OF SONOMA

PLATE H-23 K

RAINFALL, EVAPCRATION AND RUNOFF

OCT. 1972	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1		.160				
2		.256				
3		.077				
4		.077				
5		.224				
6		.512				
7		.256				
8		.192				
9	0.52	.064				
10	0.14	.064	1168*	0	1569*	0
11	0.33	.000				
12	1.12	.000	1168*	0	1569*	0
13	0.51	.064				
14	2.17	.000				
15	0.06	.077	3702	2534	3816	1247
16	0.26	.077				
17	0.57	.064	6221	2519	4940	1124
18		.064				
19		.064	6221	0	4940	0
20		.128				
21		.064	2221**	0	5087**	0
22		.000				
23		.128				
24		.224				
25		.256				
26		.096				
27		.000				
28		.128				
29		.192				
30		.480				
31		.096	2221		5087	
TOTALS	5.68	4.084		5053		2371

Evaporation reported in Inches

REMARKS

* No visual runoff from cells due to these rainfalls.

** Cell "B" runoff meter test. Cells A & E meter was turned back during servicing and testing.

COUNTY OF SONOMA

PLATE H-23 L

RAINFALL, EVAPORATION AND RUNOFF

NOV. 1972	RAIN-FALL	EVAP.	RUNOFF				REMARKS
			CELLS A & E		CELL B		
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1		.064	2221		5087		
2		.077					
3	1.33	.032					
4	0.01	.000	4889	2668	6500	1413	
5		.064					
6		.064					
7	0.56	.064	6183	1249	7438	938	
8		.288	6670	532	7588	150	
9		.128					
10	0.70	.128					
11	0.34	.224	8350	1680	8240	652	
12		.192					
13	1.06	.160	13000	4650	10050	1810	
14		.160					
15	2.09	.192	23600	10600	15560	5510	
16	0.27	.288	25790	2190	16320	760	
17		.288					
18	0.04	.256					
19	0.14	.128					
20		.224					
21		.096					
22		.192					
23		.192					
24		.128					
25		.064					
26		.064					
27		.320	25800	10	16380	60	
28		.224					
29		.160					
30		.064	25800	0	16380	0	
TOTALS	6.54	4.525		23579		11293	

Evaporation reported in Inches

COUNTY OF SONOMA

PLATE H-23 N

RAINFALL, EVAPORATION AND RUNOFF

DEC. 1972	RAIN-FALL	EVAP.	RUNOFF				REMARKS
			CELLS A & E		CELL B		* Meter failed during this period at runoff Meter repaired.
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1		.032	25800	0	16380	0	
2		.000					
3	0.24	.032					
4		.288	25800	0	16380	0	
5	0.32	.256					
6	0.56	.192	27410	1610	16910	530	
7		.320					
8		.416					
9		.320					
10		.320					
11		.1[illegible]2	28790	1380	17540	630	
12		.128					
13	0.03	.128					
14		.000					
15	0.50	.096					
16	1.83	.096					
17	0.15	.000	36000	7210	19280	1740*	
18	0.05	.032					
19	1.06	.000	41460	5460	21880	2600	
20		.000					
21		.000					
22	0.12	.256	41490	30	21880	0	
23	0.10	.032					
24		.352					
25		.864					
26		.160	41490	0	21880	0	
27		.064					
28	0.10	.480	41490	0	21880	0	
29		.352					
30		.288					
31		.736					
TOTALS	5.06	6.432		15690		5500	

Evaporation reported in Inches

COUNTY OF SONOMA

PLATE H-23 N

RAINFALL, EVAPCRATION AND RUNOFF

JAN. 1973	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1		.800				
2		.224				
3		.352				
4		.288	41490	0	21880	0
5		.244				
6		.256				
7		.000				
8	1.20	.032	45870	4380	24080	2200
9	1.03	.064	50940	5070	26340	2260
10	0.22	.064	51830	890	26780	440
11	3.07	.032	71700	19870	36540	9760
12	2.73	.000	91800	20100	45790	9250
13		.064				
14		.192				
15	0.10	.096	91810	10	45920	130
16	2.17	.224	106250	14440	51960	6040
17		.160				
18	1.81	.224	119800	13550	57630	5670
19		.416	119800	0	57630	0
20	0.50	.224				
21		.128				
22		.128	121890	2090	58060	430*
23		.128	121890	0	58060	0
24	0.24	.064	121890	0	58060	0
25	0.16	.288	122610	720	58270	210*
26		.256	122610	0	58270	0*
27		.288				
28		.288				
29	0.69	.128	124500	1890	58560	290*
30	0.08	.160	126380	1880	59100	540*
31	0.16	.244	126940	560	59170	70*
TOTALS	14.16	6.036		85450		37290

Evaporation reported in Inches

REMARKS

* Cell "B" runoff metering device malfunction. Results questionable till 2/17/73.

RAINFALL, EVAPCRATION AND RUNOFF

FEB. 1973	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1		.288	126940	0	59170	0*
2	0.05	.192	126950	10	59170	0*
3	0.40	.224				
4	1.04	.320				
5	0.35	.192				
6	0.92	.128	136560	9610	62350	3180*
7	0.04	.192	143150	6590	64990	2640*
8	0.06	.160	143190	40	64990	0
9	0.86	.160				
10	0.29	.096				
11	0.05	.224				
12	0.22	.096				
13	0.59	.128				
14	0.86	.288				
15		.288	160860	17670	71790	6800*
16		.288				
17	0.01	.288	160860	0	71790	0**
18		.384				
19		.256				
20		.416				
21		.544				
22		.256	160860	0	71860	70
23		.288				
24	0.76	.384	163423	2563	73530	1670
25	0.01	.320				
26	0.96	.224				
27	1.04	.096	172760	9337	78680	5150
28	0.03	.224				
29						
30						
TOTALS	8.54	6.944		45820		19510

Evaporation reported in Inches

REMARKS

* Cell "B" runoff metering device malfunction. Results questionable. till 2/17/73

RAINFALL, EVAPCRATION AND RUNOFF

MARCH 1973	RAIN-FALL	EVAP.	RUNOFF CELLS A & E METER READING	RUNOFF CELLS A & E TOTAL GALLONS	RUNOFF CELL B METER READING	RUNOFF CELL B TOTAL GALLONS	REMARKS
1	0.04	.288	176440	3680	81030	2350	
2		.352	176440	0	81030	0	
3	0.86	.064					
4	0.01	.192					
5		.224					
6	0.47	.256					
7		.288					
8	0.38	.320	183210	6770	86130	5100	
9		.288					
10	0.18	.096					
11		.384					
12		.576					
13		.800					
14		.736					
15		.288	183210	0	86300	170	
16		.256					
17		.416					
18		.320					
19	0.56	.064					
20		.416					
21	0.32	.384					
22		.384	184780	1570	87710	1410	
23		.544					
24		.224					
25		.256					
26		.288					
27		.544					
28		.640					
29		.448	184780	0	87710	0	
30	0.58	.032					
31		.448					
TOTALS	3.40	10.816		12020		9030	

Evaporation reported in Inches

COUNTY OF SONOMA

PLATE H-23Q

RAINFALL, EVAPCRATION AND RUNOFF

APRIL 1973	RAIN-FALL	EVAP.*	RUNOFF CELLS A & E METER READING	RUNOFF CELLS A & E TOTAL GALLONS	RUNOFF CELL B METER READING	RUNOFF CELL B TOTAL GALLONS	REMARKS
1		.576					
2		1.153					
3		.800					
4		.800					
5		.512	185780	1000	88440	730	
6		.488					
7		.608					
8		.672					
9		.672					
10		.768					
11		.320					
12		.480	185780	0	88440	0	
13	0.19	.320					
14		.384					
15		.480					
16		.192	185780	0		0	
17		.640	185780	0		0	
18		.640					
19		.640	185780	0	88440	0	
20		.961					
21		1.280					
22		.640					
23		.640					
24		.608					
25		.576	18780	0	88440	0	
26		.224					
27		.288					
28		.320					
29		.352					
30		.640	185680	0	88440	0	
TOTALS	0.19	17.674		1000		730	

*Evaporation reported in Inches

COUNTY OF SONOMA

PLATE H-23 R

RAINFALL, EVAPCRATION AND RUNOFF

MAY 1973	RAIN-FALL	EVAP.	RUNOFF				REMARKS
			CELLS A & E		CELL B		
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1		.320	185780	0	88440	0	
2		.320					
3		.384	185780	0	88440	0	
4		.412					
5		.448					
6		.544					
7		.736					
8		.832					
9		.412					
10		1.152	185780	0	88440	0	
11		.800					
12		.480					
13		.576					
14		.544					
15		.544					
16		.544					
17		.704	185780	0	88440	0	
18		.384					
19		.416					
20		.544					
21		.480					
22		.448					
23		.320	185780	0	88440	0	
24	0.07	.256					
25	0.01	.608					
26		.832					
27		.928					
28		.928					
29		.480					
30		.480					
31		.448					
TOTALS	0.08	17.304		0		0	

Evaporation reported in Inches

COUNTY OF SONOMA

PLATE H-23 S

RAINFALL, EVAPCRATION AND RUNOFF

JUNE 1973	RAIN-FALL	EVAP.	RUNOFF				REMARKS
			CELLS A & E		CELL B		
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1		.512					
2		.480					
3		.608					
4		.480					
5		.384					
6		1.217					
7		1.153	185780	0	88440	0	
8		1.856					
9		.961					
10		.864					
11		.864					
12		.928					
13		.864					
14		.896	185780	0	88440	0	
15		.832					
16		.512					
17		1.121					
18		1.153					
19		1.249					
20		1.217	185780	0	88440	0	
21		1.376					
22		.576					
23		.480					
24		.896					
25		1.249					
26		1.664					
27		1.217					
28		.640	185780	0	88440	0	
29		.704					
30		.704					
TOTALS		27.657		0		0	

Evaporation reported in Inches

COUNTY OF SONOMA

PLATE H-23T

RAINFALL, EVAPCRATION AND RUNOFF

JULY 1973	RAIN-FALL	EVAP.	RUNOFF				REMARKS
			CELLS A & E		CELL B		
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1		.768					
2		.800					
3		.736					
4		1.376					
5		.928	185780	0	88440	0	
6		.896					
7		.768					
8		1.120					
9		1.120					
10		.928					
11		,800					
12		.736	185780	0	88440	0	
13		.512					
14		.480					
15		.320					
16		.352					
17		.352					
18		.416					
19		.640	185780	0	88440	0	
20		.704					
21		.736					
22		1.344					
23		.961					
24		1.184					
25		1.504					
26		1.504	185780	0	88440	0	
27		.704					
28		.416					
29		.448					
30		.448					
31		.576					
TOTALS	0.00	24.577		0		0	

Evaporation reported in Inches

COUNTY OF SONOMA

PLATE H-23U

RAINFALL, EVAPCRATION AND RUNOFF

AUG. 1973	RAIN-FALL	EVAP.	RUNOFF				REMARKS
			CELLS A & E		CELL B		
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1		.352					
2		.448	185780	0	88440	0	
3		.480					
4		.576					
5		.640					
6		.384					
7		.480					
8		.352					
9		.448	185780	0	88440	0	
10		.640					
11		.576					
12		.320					
13		.704					
14		.640					
15		.896					
16		.736	185780	0	88440	0	
17		.544					
18		.544					
19		.640					
20		.736					
21		.640					
22		.672					
23		.736	185780	0	88440	0	
24		.800					
25		.576					
26		.544					
27		.384					
28		.576					
29		.704					
30		.480	185780	0	88440	0	
31		.736					
TOTALS	0.00	17.984		0		0	

Evaporation reported in Inches

COUNTY OF SONOMA

PLATE H-23V

RAINFALL, EVAPORATION AND RUNOFF

SEPT. 1973	RAIN-FALL	EVAP.	RUNOFF				REMARKS
			CELLS A & E		CELL B		
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1		.352					
2		.416					
3		.416					
4		.480					
5		.480					
6		.544	185780	0	88440	0	
7		.993					
8		1.888					
9		.961					
10		.416					
11		.416					
12		.416					
13		.416					
14		.416	185780	0	88440	0	
15		.320					
16		.320					
17		.320					
18		.320					
19	0.05	.320					
20	0.30	.320					
21		.448	185780	0	88440	0	
22		.160					
23	0.35	.608					
24		.480					
25	0.05	1.025					
26		1.025					
27		1.025					
28		.736	185780	0	88440	0	
29		.416					
30		.224					
TOTALS	0.75	16.677		0		0	

Evaporation reported in Inches

COUNTY OF SONOMA

PLATE H-23 W

RAINFALL, EVAPORATION AND RUNOFF

OCT. 1973	RAIN-FALL	EVAP.	RUNOFF				REMARKS
			CELLS A & E		CELL B		
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1		.416					
2		.544					
3		.846					
4		.736					
5		.736	185780	0	88440	0	
6	0.10	.224					
7		.320					
8	0.18	.128					
9		.416					
10		.608					
11		.384					
12		.576	185780	0	88440	0	
13		.704					
14		.672					
15		.128					
16		.768					
17		.864					
18		.736					
19		.416	185780	0	88440	0	
20		.192					
21	0.30	.576					
22	0.60	.160					
23	0.20	.224					
24		.416					
25		.352					
26		.384	185870	90	88600	160	
27		.576					
28		.928					
29		1.536					
30		.640					
31		.320					
TOTALS	1.38	16.544		90		160	

Evaporation reported in Inches

COUNTY OF SONOMA

PLATE H-23 X

RAINFALL, EVAPCRATION AND RUNOFF

NOV. 1973	RAIN-FALL	EVAP.	RUNOFF				REMARKS
			CELLS A & E		CELL B		
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1		.320					
2		.288	185870	0	88600	0	
3		.416					
4		.320					
5	2.20	.064					
6	0.16	.064	186370	500	89200	600	
7	0.70	.000					
8		.256					
9	1.09	.064	186910	540	89730	530	
10	1.10	.128					
11	0.90	.096					
12	0.21	.224					
13	0.30	.128					
14	0.62	.224	195120	8210	94520	4790	
15	0.50	.096					
16	0.63	.064	198250	3130	96500	1980	
17	1.10	.160					
18		.480					
19		.352	203970	5720	99350	2850	
20	0.38	.256	204940	970	100100	750	
21		.224					
22	0.25	.128					
23	0.09	.160	204940	0	100170	70	
24		.416					
25	0.03	.224					
26		.256	204940	0	100170	0	
27		.192					
28		.352					
29	0.10	.128					
30	0.80	.192	205520	580	100390	220	
TOTALS	11.16	6.272		19650		11790	

Evaporation reported in Inches

COUNTY OF SONOMA

PLATE H-23 Y

RAINFALL, EVAPCRATION AND RUNOFF

DEC. 1973	RAIN-FALL	EVAP.	RUNOFF				REMARKS
			CELLS A & E		CELL B		
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1	0.59	.192					
2		.192					
3		.128	210380	4860	103180	2790	
4		.064					
5		.192					
6		.224					
7	0.02	.032	210380	0	103180	0	
8		.032					
9		.064					
10		.064					
11	0.46	.256	212480	2100	104490	1310	
12		.128					
13	0.20	.096					
14		.064	212940	460	104920	430	
15		.064					
16		.064					
17	0.30	.160					
18		.224					
19		.096					
20		.096					
21	0.86	.064	215400	2460	106720	1800	
22		.128					
23	0.02	.032					
24		.096					
25		.000					
26	1.32	.032					
27	0.37	.000					
28	0.18	.064	226320	10920	114200	7480	
29	0.42	.160					
30		.256					
31	0.02	.096					
TOTALS	4.76	3.360		20800		13810	

Evaporation reported in Inches

COUNTY OF SONOMA

PLATE H-23 Z

RAINFALL, EVAPORATION AND RUNOFF

JAN. 1974	RAIN-FALL	EVAP.	RUNOFF				REMARKS
			CELLS A & E		CELL B		
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1		.512					
2		.576					
3	2.18	.096					
4	0.10	.192	237050	10730	122180	7980	
5	0.19	.064					
6	0.17	.064					
7		.224					
8		.224					
9		.160					
10		.064					
11	0.09	.064	237190	140	122580	400	
12	0.06	.032					
13		.064					
14	1.55	.000					
15		.384					
16	1.23	.128					
17	0.02	.096					
18	0.25	.064	252380	15190	132660	10080	
19	0.05	.096					
20		.160					
21		.480					
22		.736					
23		.832					
24		.480					
25		.192					
26		.352					
27		.640					
28		.640					
29		.640					
30		.128	252380	0	132660	0	
31	0.55	.032					
TOTALS	6.44	3.416		26060		18460	

Evaporation reported in Inches

COUNTY OF SONOMA

PLATE H-23 AA

RAINFALL, EVAPORATION AND RUNOFF

FEB. 1974	RAIN-FALL	EVAP.	RUNOFF				REMARKS
			CELLS A & E		CELL B		
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1	0.09	.224					
2		.352					
3		.256					
4		.192					
5		.672					
6		.993					
7		.448					
8		.352	252840	460	133300	640	
9		.416					
10		.352					
11		.160					
12	0.22	.192					
13		.192					
14		.256					
15		.160	252840	0	133300	0	
16	0.29	.288					
17		.288					
18	0.90	.064					
19	0.35	.384					
20		.320					
21	0.10	.128					
22		.320	257950	5110	136940	3640	
23		.352					
24		.448					
25		.288					
26	0.01	.192					
27		.256					
28	0.89	.128					
29							
30							
TOTALS	2.85	8.673		5570		4280	

Evaporation reported in Inches

COUNTY OF SONOMA

PLATE H-23 BB

RAINFALL, EVAPORATION AND RUNOFF

MAR. 1974	RAIN-FALL	EVAP.	RUNOFF				REMARKS
			CELLS A & E		CELL B		
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1	0.95	.128					
2	0.28	.192					
3	0.01	.416	265250	7300	143020	6080	
4		.256					
5		.224					
6		.128					
7	0.33	.192					
8		.384	265250	0	143300	280	
9		.256					
10	0.01	.352					
11	0.42	.032					
12	0.19	.096					
13		.320					
14		.480					
15		.256	265270	20	144190	890	
16		.160					
17		.192					
18		.256					
19		.256					
20		.448					
21		.384					
22		.224	265270	0	144190	0	
23		.192					
24		.192					
25	0.77	.032					
26	0.14	.192					
27	0.56	.160					
28	0.81	.224					
29	0.65	.096	271120	5850	149090	4900	
30	0.02	.352					
31	0.54	.256					
TOTALS	5.68	7.328		13170		12150	

Evaporation reported in Inches

COUNTY OF SONOMA

PLATE H-23 CC

RAINFALL, EVAPORATION AND RUNOFF

APR. 1974	RAIN-FALL	EVAP.	RUNOFF				REMARKS
			CELLS A & E		CELL B		
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1	1.51	.032	286370	15250	158850	9760	
2		.480					
3		.480	286370	0	158850	0	
4		.512					
5	0.30	.224					
6		.416					
7		.640					
8	0.11	.192					
9	0.12	.480					
10		.480					
11		.480					
12		.736	286370	0	159050	200	
13		1.121					
14		.448					
15		.384					
16		.480					
17		.192					
18	0.09	.224					
19		.352	286370	0	159050	0	
20		.480					
21		.224					
22		.256					
23	0.11	.320					
24	0.26	.288					
25	0.05	.288					
26		.256	286370	0	159050	0	
27		.384					
28		.608					
29		.800					
30		.224					
TOTALS	2.55	12.481		15250		9960	

Evaporation reported in Inches

COUNTY OF SONOMA

PLATE H-23 DD

RAINFALL, EVAPORATION AND RUNOFF

MAY 1974	RAIN-FALL	EVAP.	RUNOFF				REMARKS
			CELLS A & E		CELL B		
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1		.416					
2		.352					
3		.256	286370	0	159050	0	
4		.224					
5		.160					
6		.288					
7		.224					
8		.320					
9		.608					
10		.586	286370	0	159050	0	
11		.480					
12		.608					
13		.512					
14		.640					
15		.704					
16		.640					
17		.544					
18		.352					
19		.608					
20		.704	286370	0	159050	0	
21		.512					
22		.256					
23		.800					
24		.768	286370	0	159050	0	
25		.576					
26		.896					
27		.704					
28		.288					
29		.512					
30		.544					
31		.416	286370	0	159050	0	
TOTALS	0.00	15.498		0		0	

Evaporation reported in Inches

COUNTY OF SONOMA

PLATE H-23EE

RAINFALL, EVAPORATION AND RUNOFF

JUNE 1974	RAIN-FALL	EVAP.	RUNOFF				REMARKS
			CELLS A & E		CELL B		
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1		.352					
2		.384					
3		.448					
4		.961					
5		.961					
6		.961					
7		1.248	286370	0	159050	0	
8		1.952					
9		.640					
10		.640					
11		.416					
12		.352					
13		.512					
14		.544	286370	0	159050	0	
15		.544					
16		.416					
17		.416					
18	0.02	.256					
19		.512					
20		.608	286370	0	159050	0	
21		.608					
22		.512					
23		.448					
24		.416					
25		.768					
26		.768					
27		.864	286370	0	159050	0	
28		1.121					
29		.961					
30		.480					
TOTALS	0.02	20.069		0		0	

Evaporation reported in Inches

COUNTY OF SONOMA

PLATE H-23FF

SETTLEMENT DATA

CELL-MONUMENT	DATE					
	11-16-71	11-22-71	11-23-71	12-6-71	12-10-71	12-14-71
A-1	280.89	280.47	280.57	280.45		
A-2	280.34	279.91	280.09	279.95		
A-3	280.36	279.83	279.98	279.81		
A-4	280.76	280.15	280.30	280.08		
A-5	280.59	279.98	280.20	279.96		
B-1				307.28		
B-2				307.10		
B-3				306.99		
B-4				306.43		
B-5				307.11		
C-1						307.93
C-2						307.85
C-3						307.79
C-4						307.79
C-5						307.53
D-1						
D-2						
D-3						
D-4						
D-5						
E-1					281.27	
E-2					281.14	
E-3					281.15	
E-4					280.70	
E-5					280.85	

COUNTY OF SONOMA PLATE H-24A

SETTLEMENT DATA

CELL-MONUMENT	DATE					
	12-21-71	12-28-71	12-30-71	1-7-72	1-14-72	1-24-72
A-1	280.52		280.39	280.52	280.52	280.51
A-2	279.94		279.95	280.03	280.03	280.02
A-3	279.88		279.82	279.92	279.92	279.91
A-4	280.23		280.09	280.23	280.23	280.22
A-5	280.03		280.11	280.11	280.11	280.10
B-1	307.15		306.95	306.97	306.97	306.96
B-2	306.92		306.74	306.75	306.75	306.73
B-3	306.69		306.48	306.52	306.51	306.49
B-4	306.20		305.94	306.03	306.02	306.01
B-5	306.87		306.61	306.67	306.66	306.65
C-1			307.47	307.44	307.42	307.40
C-2			307.44	307.38	307.36	307.34
C-3			307.26	307.19	307.18	307.15
C-4			307.40	307.33	307.31	307.29
C-5			307.13	307.06	307.04	307.02
D-1		306.97	306.55	306.51	306.49	306.45
D-2		307.21	306.77	306.76	306.74	306.71
D-3		306.82	306.27	306.27	306.24	306.20
D-4		305.91	305.55	305.57	305.55	305.51
D-5		306.16	305.59	305.64	305.61	305.58
E-1	280.90		280.70	280.94	280.93	280.91
E-2	280.73		280.57	280.83	280.74	280.72
E-3	280.72		280.47	280.76	280.75	280.73
E-4	280.35		280.20	280.47	280.47	280.45
E-5	280.60		280.34	280.70	280.68	280.67

COUNTY OF SONOMA PLATE H-24B

SETTLEMENT DATA

CELL-MONUMENT	DATE					
	1-31-72	2-14-72	3-2-72	3-31-72	4-28-72	6-1-72
A-1	280.51	280.50	280.52	280.49	280.50	280.50
A-2	280.00	280.01	280.03	280.01	280.02	280.02
A-3	279.91	279.91	279.91	279.90	279.91	279.89
A-4	280.22	280.22	280.23	280.22	280.22	280.21
A-5	280.10	280.10	280.10	280.09	280.10	280.10
B-1	306.95	306.95	306.95	306.93	306.93	306.93
B-2	306.72	306.72	306.72	306.71	306.71	306.70
B-3	306.50	306.49	306.48	306.47	306.46	306.46
B-4	306.01	306.00	306.00	305.99	305.98	305.98
B-5	306.65	306.64	306.63	306.62	306.61	306.61
C-1	307.40	307.38	307.37	307.35	307.33	307.32
C-2	307.34	307.31	307.31	307.28	307.26	307.24
C-3	307.14	307.12	307.11	307.09	397.06	307.05
C-4	307.28	307.26	307.25	307.22	307.21	307.19
C-5	307.01	307.00	306.99	306.96	306.93	306.90
D-1	306.45	306.42	306.41	306.39	306.37	306.36
D-2	306.70	306.68	306.68	306.66	306.65	306.64
D-3	306.19	306.17	306.16	306.13	306.11	306.11
D-4	305.55	305.48	305.48	305.45	305.43	305.42
D-5	305.56	305.54	305.53	305.51	305.49	305.48
E-1	280.91	280.90	280.91	280.89	280.89	280.88
E-2	280.71	280.70	280.71	280.67	280.68	280.65
E-3	280.73	280.72	280.72	280.70	280.71	280.71
E-4	280.45	280.44	280.45	280.43	280.44	280.44
E-5	280.67	280.67	280.67	280.65	280.65	280.64

COUNTY OF SONOMA

PLATE H-24 C

SETTLEMENT DATA

CELL-MONUMENT	DATE					
	8-17-72	10-13-72	11-20-72	1-3-73	4-4-73	7-3-73
A-1	280.48	280.48	280.46	280.46	280.45	280.45
A-2	280.01	279.99	279.98	279.97	279.97	279.96
A-3	279.89	279.88	279.86	279.86	279.86	279.85
A-4	280.21	280.20	280.18	280.18	280.17	280.17
A-5	280.09	280.08	280.06	280.06	280.06	280.06
B-1	306.89	306.88	306.86	306.86	306.85	306.84
B-2	306.67	306.66	306.64	306.64	306.63	306.63
B-3	306.41	306.40	306.40	306.39	306.38	306.37
B-4	305.95	305.94	305.93	305.93	305.92	305.92
B-5	306.57	306.56	306.55	306.55	306.54	306.53
C-1	307.28	307.25	307.23	307.23	307.22	307.21
C-2	307.19	307.15	307.12	307.11	307.10	307.09
C-3	306.98	306.95	306.93	306.91	306.90	306.89
C-4	307.14	307.11	307.10	307.08	307.07	307.07
C-5	306.84	306.80	306.77	306.76	306.75	306.74
D-1	306.31	306.28	306.26	306.25	306.24	306.24
D-2	306.59	306.56	306.54	306.53	306.51	306.50
D-3	306.03	305.99	305.97	305.95	305.94	305.92
D-4	305.36	305.33	305.31	305.30	305.29	305.28
D-5	305.39	305.36	305.33	305.31	305.29	305.24
E-1	280.86	280.85	280.83	280.82	280.81	280.80
E-2	280.61	280.60	280.58	280.57	280.56	280.54
E-3	280.67	280.66	280.65	280.64	280.63	280.62
E-4	280.42	280.41	280.39	280.39	280.37	280.37
E-5	280.61	280.60	280.58	280.58	280.57	280.56

COUNTY OF SONOMA

PLATE H-24 D

SETTLEMENT DATA

CELL-MONUMENT	DATE					
	10-2-73	1-4-74	4-2-74	7-3-74		
A-1	280.43	280.42	280.42	280.40		
A-2	279.96	279.94	279.94	279.92		
A-3	279.84	279.82	279.82	279.80		
A-4	280.16	280.14	280.14	280.12		
A-5	280.04	280.03	280.02	280.00		
B-1	306.83	306.81	306.80	306.79		
B-2	306.62	306.61	306.60	306.59		
B-3	306.36	306.34	306.34	306.32		
B-4	305.90	305.89	305.88	305.87		
B-5	306.52	306.50	306.50	306.49		
C-1	307.20	307.16	307.16	307.15		
C-2	307.06	307.03	307.01	307.00		
C-3	306.86	306.83	306.82	306.81		
C-4	307.05	307.02	307.01	307.01		
C-5	306.71	306.68	306.67	306.66		
D-1	306.21	306.19	306.17	306.07		
D-2	306.43	306.38	306.34	306.24		
D-3	305.85	305.81	305.77	Disturbed		
D-4	305.24	305.22	305.19	305.09		
D-5	305.20	305.01	304.96	304.83		
E-1	280.79	280.77	280.77	280.75		
E-2	280.52	280.52	280.52	280.48		
E-3	280.60	280.58	280.58	280.56		
E-4	280.35	280.34	280.33	280.31		
E-5	280.53	280.50	280.50	280.47		

COUNTY OF SONOMA

PLATE H-24 E

FLUID ROUTING CELL "C"

Date	Leachate Collection				Distribution				Fluid Ret. In Refuse
	Start (In)	End (In)	Total (In)	Total (Gal)	Start (In)	End (In)	Total (In)	Total (Gal)	
1971 * 12-30	5.8			2000*	68.1			14933*	12933
12-31	6.5				73.5	1.0	67.1	803.2	
1972 1-3	7.8				73.5	1.0	72.5	868.4	
1-4	7.9				73.5	1.0	72.5	868.4	
1-5	7.9				73.3	1.0	78.5	868.4	
1-7	8.5				73.2	1.0	72.3	865.4	
1-10	8.6				73.5	1.0	72.2	865.4	
1-11	8.8				68.0	1.0	72.5	868.4	
1-12	8.8				73.5	1.0	67.0	802.5	
1-13	9.0				73.5	1.0	72.5	868.4	
1-14	9.0				73.5	1.0	72.5	868.4	
1-17	9.4				74.3	1.0	72.5	868.4	
1-18	9.5				72.7	1.0	73.3	877.4	
1-19	9.6				72.6	0.0	72.7	870.5	
1-20	10.1				73.2	0.0	72.6	869.0	
1-21	12.4				83.5	0.0	73.2	876.2	
1-24	28.4				73.8	0.0	83.5	999.5	
1-25	33.2				72.3	0.0	73.8	883.4	
1-26	40.3				73.3	0.0	72.3	865.4	
						0.0	73.3	877.4	

Leachate This Sheet	2000	Distribution This Sheet	31467
Leachate Prior Sheet	0	Distribution Prior Sheet	0
Total Leachate	2000	Total Distribution	31467

*8,000 gallons applied by water truck during refuse placement. 6,993 gallons applied by 2.27"total rainfall during refuse placement operation.

COUNTY OF SONOMA

PLATE H-25A

FLUID ROUTING CELL "C"

Date	Leachate Collection				Distribution				Fluid Ret. In Refuse
	Start (In)	End (In)	Total (In)	Total (Gal)	Start (In)	End (In)	Total (In)	Total (Gal)	
1972 1-27	49.4				72.8				
1-28	60.6	1.0	59.6	713.4	74.3	0.0	72.8	871.4	29625
1-31	39.5	1.0	38.5	460.8	72.5	0.0	74.3	889.3	30054
2-1	9.4				73.0	6.7	65.8	787.6	
2-2	19.5				71.5	0.0	73.0	873.8	
2-3	31.1				00.0	0.0	71.5	855.9	
2-4	42.2	1.4	40.8	488.4	00.0	0.0	00.0	000.0	32082
2-7	34.8	2.0	32.8	392.6	71.4	0.0	00.0	000.0	31690
2-8	11.0				72.2	0.0	71.4	854.7	
2-9	22.8				72.4	1.0	71.2	852.3	
2-10	34.0	24.1	9.9	118.5	72.5	1.5	70.9	848.7	34127
2-11	35.1	22.7	12.4	271.7	72.9	1.6	70.9	848.7	34704
2-12	45.6	1.0	44.6	533.9	1.0	1.0	71.9	860.6	35031
2-13	25.1				1.0	1.0	00.0	000.0	
2-14	39.3				72.5	1.0	00.0	000.0	
2-15	53.1	1.4	51.7	618.8	72.4	1.0	71.5	855.9	35268
2-16	14.4				72.2	1.2	71.2	852.3	
2-17	34.3				72.5	1.0	71.2	852.3	
2-18	58.3	6.0	52.3	626.0	72.5	1.0	71.5	855.9	37202
2-19	32.4				72.6	1.4	71.1	851.1	
						1.0	71.6	857.1	

Leachate This Sheet	4224	Distribution This Sheet	13668
Leachate Prior Sheet	2000	Distribution Prior Sheet	31467
Total Leachate	6224	Total Distribution	45135

COUNTY OF SONOMA

PLATE H-25 B

FLUID ROUTING CELL "C"

Date	Leachate Collection Start (In)	Leachate Collection End (In)	Leachate Collection Total (In)	Leachate Collection Total (Gal)	Distribution Start (In)	Distribution End (In)	Distribution Total (In)	Distribution Total (Gal)	Fluid Ret. In Refuse
1972									
2-20	60.3	5.0	55.3	661.9	72.8	1.0	71.8	859.4	38249
2-21	33.2				72.5	1.0	71.5	855.9	
2-22	62.2	1.0	61.2	732.6	73.2	4.3	68.9	824.7	39231
2-23	31.1				72.8	13.3	59.5	712.2	
2-24	67.5	1.0	66.5	796.0	72.3	28.2	44.1	527.9	39972
2-25	24.0				72.9	1.0	71.9	860.6	
2-26	54.7	4.0	50.7	606.9	72.3	1.0	71.3	853.5	40754
2-27	30.3				72.5	3.0	69.5	831.9	
2-28	64.5	6.0	58.5	700.2	72.3	1.0	71.3	853.5	41739
2-29	48.2	1.6	47.2	564.9	74.5	1.0	73.5	879.8	42028
3-1	37.8	5.0	32.8	392.6	72.5	1.0	71.5	855.9	42515
3-2	42.9	6.0	36.9	441.7	72.5	1.0	71.5	855.9	42929
3-3	44.1	6.0	38.1	456.1	72.7	1.0	71.7	858.2	43329
3-4	45.5	5.0	40.5	484.8	72.7	1.0	71.7	858.2	43702
3-5	40.7	5.0	35.7	427.3	72.7	1.0	71.7	858.2	44133
3-6	42.3	5.0	37.3	446.5	72.9	2.0	70.9	848.7	44545
3-7	45.0	5.0	40.0	478.8	72.6	1.0	71.6	857.1	44915
3-8	44.3	6.0	38.3	458.5	72.8	1.0	71.8	859.4	45313
3-9	47.9	5.0	42.9	513.5	72.9	1.0	71.9	860.6	45659
3-10	46.8	5.0	41.8	500.3	72.9	1.0	71.9	860.6	46020
3-11	49.1	5.1	44.1	527.9	72.8				46352

Leachate This Sheet	9191	Distribution This Sheet	16632
Leachate Prior Sheet	6224	Distribution Prior Sheet	45135
Total Leachate	15415	Total Distribution	61767

COUNTY OF SONOMA

PLATE H-25 C

FLUID ROUTING CELL "C"

Date	Leachate Collection Start (In)	Leachate Collection End (In)	Leachate Collection Total (In)	Leachate Collection Total (Gal)	Distribution Start (In)	Distribution End (In)	Distribution Total (In)	Distribution Total (Gal)	Fluid Ret. In Refuse
1972									
3-12	46.6	5.0	41.6	497.9	72.9	1.0	71.8	859.4	46714
3-13	45.3	4.0	41.3	494.4	72.9	1.0	71.9	860.6	47080
3-14	49.6	5.0	44.6	533.9	73.0	1.0	71.9	860.6	47407
3-15	51.4	5.0	46.4	555.4	73.0	1.0	72.0	861.8	47714
3-16	61.7	6.4	55.3	661.9	1.0	1.0	72.0	861.8	47913

Leachate This Sheet	2743	Distribution This Sheet	4304
Leachate Prior Sheet	15415	Distribution Prior Sheet	61767
Total Leachate	18158	Total Distribution	66071

COUNTY OF SONOMA

PLATE H-25 D

FLUID ROUTING CELL "C"

Date	Leachate Collection		Distribution		Fluid
	Meter Reading	Total Gallons Leachate Generated	Meter Reading	Total Gallons Distributed	Retained in Refuse
3-16-72	000		000		
3-17-72	362	362	1233	1233	48784
3-24-72	3822	3460	6771	5538	50862
3-26-72	5118	1296	8366	1595	51161
3-28-72	6293	1175	9881	1515	51501
3-30-72	7350	1057	11810	1929	52373
4-1-72	8475	1125	13412	1602	52850
4-5-72	11193	2718	16692	3280	53412
4-7-72	12556	1363	19264	2572	54621
4-10-72	14592	2036	21901	2637	55222
4-11-72	15391	799	23438	1537	55960
4-14-72	17734	2343	26352	2914	56531
4-21-72	22072	4338	33368	7016	59209
4-28-72	27102	5030	40303	6935	61114
5-8-72	33540	6438	49330	9027	63703
5-11-72	35191	1651	51477	2147	64199
5-17-72	39010	3819	56302	4825	65205
5-23-72	42251	3241	60010	3708	65672
5-31-72	46622	4371	64931	4921	66222
6-9-72	52567	5945	71820	6889	67166

Leachate This Sheet	52567	Distribution This Sheet	71820
Leachate Prior Sheet	18158	Distribution Prior Sheet	66071
Total Leachate	70725	Total Distribution	137891

County of Sonoma

Plate H-25 E

FLUID ROUTING CELL "C"

Date	Leachate Collection		Distribution		Fluid
	Meter Reading	Total Gallons Leachate Generated	Meter Reading	Total Gallons Distributed	Retained in Refuse
6-16-72	56288	3721	75667	3847	67292
6-23-72	59299	3011	78685	3018	67299
6-29-72	60956	1657	80052	1367	67009
7-3-72	63070	2114	83760	3708	67603
7-10-72	66970	3900	89020	5260	69963
7-18-72	71700	4730	95270	6250	71483
7-25-72	76070	4370	100766	5496	72609
8-1-72	80164	4094	106140	5374	73889
8-9-72	84360	4196	111880	5740	75433
8-14-72	87394	3034	115860	3980	76379
8-22-72	92050	4656	121623	5763	77486
8-30-72	94164	2114	126490	4867	80239
9-5-72	94164	(3300)*	130740	4250	81189
9-18-72	101230	7066	140100	9360	83483
9-27-72	106400	5170	146490	6390	84703
10-3-72	110395	3995	151020	4530	85238
10-10-72	114430	4035	155790	4770	85973
10-19-72	122560	8130	161580	5790	83633
11-7-72	135080	12520	173450	11870	82983
11-16-72	140590	5510	178370	4920	82393

Leachate This Sheet	91323	Distribution This Sheet	106550
Leachate Prior Sheet	70725	Distribution Prior Sheet	137891
Total Leachate	162048	Total Distribution	244441

* Collection line broke and leachate generation data during this period was lost. Estimate 3300 gallons.

County of Sonoma

Plate H-25 F

FLUID ROUTING CELL "C"

Date	Leachate Collection		Distribution		Fluid
	Meter Reading	Total Gallons Leachate Generated	Meter Reading	Total Gallons Distributed	Retained in Refuse
		7190		7550	82753
11-27-72	147780		185920		
		5350		5110	82513
12-6-72	153130		191030		
		2920		1740	81333
12-11-72	156050		192770		
		1830		0	79503
12-18-72	157880		192770		
		3110		3640	80033
12-26-72	160990		196410		
		5050		6490	81473
1-4-73	166040		202900		
		4580		5600	82493
1-11-73	170620		208500		
		4790		4450	82253
1-18-73	175410		212950		
		4685		4980	82548
1-26-73	180095		217930		
		3075		2870	82343
2-1-73	183170		220800		
		3290		3940	82993
2-8-73	186460		224740		
		2990		3180	83183
2-15-73	189450		227920		
		2710		1760	82233
2-22-73	192160		229680		
		1630		1710	82313
3-1-73	193790		231390		
		1860		2720	83173
3-8-73	195650		234110		
		4810		5930	84293
3-15-72	200460		240040		
		3670		4980	85603
3-22-73	204130		245020		
		3560		5720	87763
3-29-73	207690		250740		
		3300		5200	89663
4-5-73	210990		255940		
		4180		5210	90693
4-12-73	215170		261150		

Leachate This Sheet	74580	Distribution This Sheet	82780
Leachate Prior Sheet	162048	Distribution Prior Sheet	244441
Total Leachate	236628	Total Distribution	327221

County of Sonoma

Plate H-25 G

FLUID ROUTING CELL "C"

Date	Leachate Collection		Distribution		Fluid
	Meter Reading	Total Gallons Leachate Generated	Meter Reading	Total Gallons Distributed	Retained in Refuse
		2200		370	88863
4-19-73	217370		261520		
		2980		4240	90123
4-26-73	220350		265760		
		2230		3790	91683
5-3-73	222580		269550		
		1730		2160	92113
5-10-73	224310		271710		
		2430		6080	95763
5-17-73	226740		277790		
		1190		4270	98843
5-24-73	227930		282060		
		1200		1690	99333
5-31-73	229130		283750		
		1910		4900	102323
6-7-73	231040		288650		
		2300		3750	103773
6-14-73	233340		292400		
		2910		4620	105483
6-21-73	236250		297020		
		1970		2980	106493
6-28-73	238220		300000		
		2720		4990	108763
7-5-73	240940		304990		
		1820		3070	110013
7-12-73	242760		308060		
		2950		5260	112323
7-19-73	245710		313320		
		2500		4000	113823
7-26-73	248210		317320		
		1850		4760	116733
8-2-73	250060		322080		
		3550		4580	117763
8-9-73	253610		326660		
		2720		3890	118933
8-16-73	256330		330550		
		2210		3350	120073
8-23-73	258540		333900		

Leachate This Sheet	43370	Distribution This Sheet	72750
Leachate Prior Sheet	236628	Distribution Prior Sheet	327221
Total Leachate	279998	Total Distribution	399971

County of Sonoma

Plate H-25 H

FLUID ROUTING CELL "C"

Date	Leachate Collection		Distribution		Fluid Retained in Refuse
	Meter Reading	Total Gallons Leachate Generated	Meter Reading	Total Gallons Distributed	
8-30-73	261900	3360	339270	5370	122083
9-6-73	265410	3510	344365	5095	123668
9-14-73	267950	2540	346720	2355	123483
9-21-73	269900	1950	349760	3040	124573
9-28-73	271610	1710	351160	1400	124263
10-5-73	273380	1770	353640	2480	124973
10-12-73	275320	1940	355970	2330	125363
10-19-73	277630	2310	360930	4960	128013
10-26-73	280820	3190	363540	2610	127433
11-2-73	283800	2980	369920	6380	130833
11-9-73	289490	5690	375270	5350	130493
11-16-73	298820	9330	380970	5700	126863
11-23-73	305970	7150	386550	5580	125293
11-30-73	309160	4990*	389790	3240	123543
12-7-73	311900	4240*	392650	2860	122163
12-14-73	315980	4080	395810	3160	121243
12-21-73	320500	4520	399800	3990	120713
12-28-73	326480	5980	403870	4070	118803
1-4-74	332970	6490	407670	3800	116113
1-11-74	338470	5500	411060	3390	114003

Leachate This Sheet	83230	Distribution This Sheet	77160
Leachate Prior Sheet	279998	Distribution Prior Sheet	399971
Total Leachate	363228	Total Distribution	477131

*An estimated amount of leachate lost due to equipment failure was figured into this total.

County of Sonoma

Plate H-25 I

FLUID ROUTING CELL "C"

Date	Leachate Collection		Distribution		Fluid Retained in Refuse
	Meter Reading	Total Gallons Leachate Generated	Meter Reading	Total Gallons Distributed	
1-18-74	344200	5730	414610	3550	111823
1-30-74	351220	7020	419800	5190	109993
2-8-74	355190	3970	422540	2740	108763
2-15-74	357710	2520	425420	2880	109123
2-22-74	360340	2630	427140	1720	108213
3-4-74	364110	3770	428700	1560	106003
3-8-74	365470	1360	429270	570	105213
3-15-74	368370	2900	433300	4030	106343
3-22-74	371230	2860	436090	2790	106273
3-29-74	374230	3000	438530	2440	105713
4-3-74	377290	3060	440020	1490	104143
4-12-74	380610	3320	443830	3810	104633
4-19-74	383510	2900	446830	3000	104733
4-26-74	386410	2900	449630	2800	104633
5-3-74	388840	2430	451740	2110	104313
5-10-74	391070	2230	455090	3350	105433
5-20-74	393370	2300	457950	2860	105993
5-24-74	394500	1130	460060	2110	106973
5-31-74	396640	2140	462930	2870	107703
6-7-74	398590	1950	466360	3430	109183

Leachate This Sheet	60120	Distribution This Sheet	55300
Leachate Prior Sheet	363228	Distribution Prior Sheet	477131
Total Leachate	423348	Total Distribution	532431

County of Sonoma

Plate H-25 J

FLUID ROUTING CELL "C"

Date	Leachate Collection		Distribution		Fluid Retained in Refuse
	Meter Reading	Total Gallons Leachate Generated	Meter Reading	Total Gallons Distributed	
6-14-74	400610	2020	469520	3160	110323
6-21-74	402370	1760	473230	3710	112273
6-27-74	404620	2250	477770	4540	114563
7-5-74	406870	2250	482320	4550	116863

Leachate This Sheet	8280	Distribution This Sheet	15960
Leachate Prior Sheet	423348	Distribution Prior Sheet	532431
Total Leachate	431628	Total Distribution	548391

County of Sonoma

Plate H-25 K

FLUID ROUTING CELL "D"

Date	Leachate Collection				Distribution				Fluid Ret. In Refuse
	Start (In)	End (In)	Total (In)	Total (Gal)	Start (In)	End (In)	Total (In)	Total (Gal)	
*				1500*				8063*	6563
1971 12-30	70.0				56.6	0.0	56.6	682.2	
12-31	5.6				70.6	0.0	70.6	851.8	
1972 1-3	27.5				73.8	0.0	73.8	889.5	
1-4	27.6				73.3	0.0	73.3	883.5	
1-5	27.9				72.2	0.0	72.2	871.4	
1-7	28.5				73.3	0.0	73.3	883.5	
1-10	28.8				72.5	0.0	72.5	874.4	
1-11	30.0				72.0	0.0	72.0	868.4	
1-12	31.8				72.0	0.0	72.0	868.4	
1-13	40.0				72.0	0.0	72.0	868.4	
1-14	48.8				71.0	0.0	71.0	856.3	
1-15	58.8	1.3	56.5	679.7	56.4	0.0	56.4	679.9	15281
1-17	26.2				71.5	0.0	71.5	867.2	
1-18	34.4				71.1	0.0	71.1	857.3	
1-19	49.7				71.2	0.0	71.2	858.7	
1-20	73.4	1.0	72.4	866.6	71.2	1.0	70.7	852.6	17678
1-21	23.4	1.0	22.4	268.1	76.2	1.0	75.2	906.9	18262
1-24	69.9	1.0	68.9	824.7	69.4	1.0	68.4	824.9	18344
1-25	12.3	1.0	11.3	135.3	62.3	9.3	53.0	639.2	19034
1-26	17.4	1.0	16.4	196.3	70.9				19477

Leachate This Sheet	4471	Distribution This Sheet	23948
Leachate Prior Sheet	0	Distribution Prior Sheet	0
Total Leachate	4471	Total Distribution	23948

*8,063 gallons of rain water added during refuse placement.
1,500 gallons of leachate generated during refuse placement.

COUNTY OF SONOMA PLATE H-26 A

FLUID ROUTING CELL "D"

Date	Leachate Collection				Distribution				Fluid Ret. In Refuse
	Start (In)	End (In)	Total (In)	Total (Gal)	Start (In)	End (In)	Total (In)	Total (Gal)	
1972						0.0	70.9	855.1	
1-27	27.3	1.0	26.3	314.8	72.5	10.9	61.6	742.9	20017
1-28	33.4	1.0	32.4	387.8	70.7	0.0	70.7	852.6	20372
1-31	81.5	2.0	79.5	951.6	72.5	0.0	72.5	875.0	20273
2-1	16.5	1.0	15.5	185.5	70.5	0.0	70.5	850.9	20963
2-2	22.4	1.0	21.4	256.2	71.6	0.0	71.6	864.1	21557
2-3	42.8	1.0	41.8	500.3	45.1	0.0	45.1	544.3	21921
2-4	42.0	1.0	41.0	490.7	43.1	0.0	43.1	520.2	21975
2-7	81.4	2.0	79.4	950.4	72.3	12.3	60.0	724.1	21545
2-8	16.5	1.0	15.5	185.5	71.4	2.0	69.4	837.6	22083
2-9	20.6	1.0	19.6	234.6	72.9	11.0	61.9	747.1	22686
2-10	41.6	2.0	39.6	474.0	72.8	14.8	58.0	700.0	22959
2-11	47.6	1.0	46.6	557.8	70.2	15.3	54.9	662.6	23102
2-12	48.2	1.0	47.2	564.9	65.3	13.5	51.8	625.2	23199
2-13	47.5	1.0	46.5	556.6	62.4	22.0	40.4	487.6	23268
2-14	31.8	1.0	30.8	368.7	73.0	19.3	53.7	648.1	23387
2-15	40.6	1.0	39.6	474.0	73.1	23.3	49.8	601.0	23561
2-16	39.2	1.0	38.2	457.3	72.1	19.7	52.4	632.4	23705
2-17	42.6	1.5	41.1	492.0	71.1	21.1	50.0	603.5	23845
2-18	42.6	1.0	41.6	497.9	71.2	19.0	52.2	630.0	23951
2-19	43.3	1.0	42.3	506.3	72.6				24074

Leachate This Sheet	1407	Distribution This Sheet	14004
Leachate Prior Sheet	4471	Distribution Prior Sheet	23948
Total Leachate	13878	Total Distribution	37952

COUNTY OF SONOMA PLATE H-26 B

FLUID ROUTING CELL"D"

Date	Leachate Collection				Distribution				Fluid Ret. In Refuse
	Start (In)	End (In)	Total (In)	Total (Gal)	Start (In)	End (In)	Total (In)	Total (Gal)	
1972									
2-20	41.3	1.0	40.3	482.4	72.5	21.4	51.2	617.9	24210
2-21	37.5	1.0	36.5	436.9	72.9	23.4	49.1	592.6	24365
2-22	33.7	1.0	32.7	391.4	72.3	28.2	44.7	539.5	24514
2-23	37.8	2.0	35.8	428.5	81.0	31.6	40.7	491.2	24576
2-2	52.4	11.8	40.6	485.9	72.7	1.0	80.0	965.5	25056
2-25	46.7	2.0	44.7	535.1	72.3	1.0	71.7	865.3	25386
2-26	58.9	1.0	57.9	693.1	72.3	1.0	71.3	860.5	25553
2-27	50.9	1.0	49.9	597.3	72.5	1.0	71.3	860.5	25817
2-28	55.3	2.0	53.3	638.0	72.3	1.0	71.5	862.9	26042
2-29	62.3	1.0	61.3	733.8	72.1	1.0	71.3	860.5	26168
3-1	60.5	2.0	58.5	700.2	72.8	1.0	71.1	858.1	26326
3-2	60.8	2.0	58.8	703.8	72.6	1.0	71.8	866.5	26489
3-3	60.8	3.0	57.8	691.9	72.8	1.0	71.6	864.1	26661
3-4	66.5	2.0	64.5	772.1	72.9	0.0	72.8	878.6	26768
3-5	59.9	2.0	57.9	690.7	72.9	1.0	71.9	867.8	26945
3-6	61.0	2.0	59.0	706.2	72.9	1.0	71.9	867.8	27106
3-7	64.5	1.0	63.5	760.1	73.0	1.0	71.9	867.8	27214
3-8	60.7	2.0	58.7	702.6	72.9	1.0	72.0	868.9	27380
3-9	59.7	3.0	56.7	678.7	72.8	1.0	71.9	867.8	27569
3-10	60.7	2.0	58.7	702.6	73.0	1.0	71.8	866.5	27733
						1.0	72.0	868.9	

Leachate This Sheet	12531	Distribution This Sheet	17059
Leachate Prior Sheet	13878	Distribution Prior Sheet	37952
Total Leachate	26409	Total Distribution	55011

COUNTY OF SONOMA • PLATE H-26 C

FLUID ROUTING CELL"D"

Date	Leachate Collection				Distribution				Fluid Ret. In Refuse
	Start (In)	End (In)	Total (In)	Total (Gal)	Start (In)	End (In)	Total (In)	Total (Gal)	
1972									
3-11	58.4	1.0	57.4	687.1	73.0	1.0	72.0	868.9	27915
3-12	55.0	1.0	54.0	646.4	72.9	1.0	71.9	867.8	28138
3-13	54.8	1.0	53.8	643.9	73.0	1.0	72.0	868.9	28361
3-14	61.1	1.0	60.1	719.4	72.9	1.0	71.9	867.8	28511
3-15	59.6	1.0	58.6	701.4	73.0	1.0	72.0	868.9	28677
	Leachate adjustment for pumping operation			1506.5					28040

Leachate This Sheet	4905	Distribution This Sheet	4343
Leachate Prior Sheet	26409	Distribution Prior Sheet	5501
Total Leachate	31314	Total Distribution	59354

COUNTY OF SONOMA PLATE H-26 D

FLUID ROUTING CELL "D"

Date	Leachate Collection		Distribution (Leachate & Fresh Water)			Fluid Retained in Refuse (4+6)
			Fresh Water Added			
	Meter Reading	Total Gal. Leachate Generated (1-3)	Meter Reading	Gallons Added (3-1)	Total Distribution (4+2)	
	1	2	3	4	5	6
3-15-72	000		000			
3-16-72	889	889	1000	111	1000	28151
3-17-72	1673	673	1800	127	800	28278
3-24-72	6917	5117	7100	183	5300	28461
3-26-72	8390	1290	8620	230	1520	28691
3-28-72	9921	1301	10240	319	1620	29010
3-30-72	11643	1403	11960	317	1720	29327
4-1-72	13352	1392	13630	278	1670	29605
4-5-72	17395	3765	17800	405	4170	30010
4-7-72	19574	1774	19787	213	1987	30223
4-10-72	22051	2264	22300	249	2513	30472
4-11-72	23133	833	23300	167	1000	30639
4-14-72	26420	3120	26420	0	3120	30639
4-21-72	33072	6652	33450	378	7030	31017
4-28-72	42378	8928	42378	0	8928	31017
5-8-72	52260	9882	52260	0	9882	31017
5-11-72	54547	2287	54760	213	2500	31230
5-17-72	59062	4302	59400	338	4640	31568
5-23-72	63282	3882	63800	518	4400	32086

Leachate This Sheet	59754	Distribution This Sheet	63800
Leachate Prior Sheet	31314	Distribution Prior Sheet	59354
Total Leachate	91068	Total Distribution	123154

COUNTY OF SONOMA PLATE H-26 E

FLUID ROUTING CELL "D"

Date	Leachate Collection		Distribution (Leachate & Fresh Water)			Fluid Retained in Refuse (4+6)
			Fresh Water Added			
	Meter Reading	Total Gal. Leachate Generated (1-3)	Meter Reading	Gallons Added (3-1)	Total Distribution (4+2)	
	1	2	3	4	5	6
5-31-72	69953	6153	70450	497	6650	32583
6-9-72	78027	7577	78400	373	7950	32956
6-16-72	83347	4947	83917	570	5517	33526
6-23-72	89513	5596	90068	555	6151	34081
6-29-72	95122	5054	95630	508	5562	34589
7-3-72	99470	3840	99620	150	3990	34739
7-10-72	104570	4950	104750	180	5130	34919
7-18-72	112217	7467	112720	503	7970	35422
7-25-72	119420	6700	119620	200	6900	35622
8-1-72	125680	6060	125950	270	6330	35892
8-9-72	132053	6103	132200	147	6250	36039
8-14-72	136268	4068	136600	332	4400	36371
8-22-72	143744	7144	143900	156	7300	36527
8-30-72	150919	7019	151450	531	7550	37058
9-5-72	156475	5025	156770	295	5320	37353
9-18-72	165567	8797	166807	1240	10037	38593
9-27-72	172050	5243	172740	690	5933	39283
10-3-72	176144	3404	177205	1061	4465	40344
		4756		2039	6795	42383

Leachate This Sheet	109903	Distribution This Sheet	120200
Leachate Prior Sheet	91068	Distribution Prior Sheet	123154
Total Leachate	200971	Total Distribution	243354

COUNTY OF SONOMA PLATE H-26 F

FLUID ROUTING CELL "D"

Date	Leachate Collection		Distribution (Leachate & Fresh Water)			Fluid Retained in Refuse (4+6)
	Meter Reading	Total Gal. Leachate Generated (1-3)	Fresh Water Added		Total Distribution (4+2)	
			Meter Reading	Gallons Added (3-1)		
	1	2	3	4	5	6
10-10-72	181961		184000			
		9070		0	9070	42383
10-19-72	193070		193070			
		16640		2840	19480	45223
11-7-72	209710		212550			
		15340		0	15340	45223
11-16-72	227890		227890			
		21860		0	21860	45223
11-27-72	249750		249750			
		13160		0	13160	45223
12-6-72	262910		262910			
		7940*		-2400*	5540	42823
12-11-72	268450		268450			
		5570		0	5570	42823
12-18-72	274020		274020			
		19530		0	19530	42823
12-26-72	293550		293550			
		20740		0	20740	42823
1-4-73	314290		314290			
		15290		0	15290	42823
1-11-73	329580		329580			
		27770		0	27770	42823
1-18-73	357350		357350			
		34810		0	34810	42823
1-26-73	392160		392160			
		26480		0	26480	42823
2-1-73	418640		418640			
		32130		0	32130	42823
2-8-73	450770		450770			
		33660		0	33660	42823
2-15-73	484430		484430			
		34130		0	34130	42823
2-22-73	518560		518560			
		33000		0	33000	42823
3-1-73	551560		551560			
		33290		0	33290	42823
3-8-73	584850		584850			
Leachate This Sheet		400410	Distribution This Sheet		400850	
Leachate Prior Sheet		200971	Distribution Prior Sheet		243354	
Total Leachate		601381	Total Distribution		644204	

* 2,400 gallons leachate lost on Dec. 9, 1972, due to frozen leachate return line.

COUNTY OF SONOMA

PLATE H-26G

FLUID ROUTING CELL "D"

Date	Leachate Collection		Distribution (Leachate & Fresh Water)			Fluid Retained in Refuse (4+6)
	Meter Reading	Total Gal. Leachate Generated (1-3)	Fresh Water Added		Total Distribution (4+2)	
			Meter Reading	Gallons Added (3-1)		
	1	2	3	4	5	6
		30570		0	30570	42823
3-15-73	615420		615420			
		26180		0	26180	42823
3-22-73	641600		641600			
		23300		0	26180	42823
3-29-73	664900		664900			
		19120		0	19120	42823
4-5-73	684020		684020			
		13560		0	13560	42823
4-12-73	697580		697580			
		8540		-400*	8540	42423
4-19-73	706120		706120			
		6607		233	6840	42656
4-26-73	712727		712960			
		5643		307	5950	42963
5-3-73	718603		718910			
		5882		158	6040	43121
5-10-73	724792		724950			
		4991		429	5420	43550
5-17-73	729941		730370			
		4028		182	4210	43732
5-24-73	734398		734580			
		6193		567	6760	44299
5-31-73	740773		741340			
		6000		800	6800	45099
6-7-73	747340		748140			
		7257		418	7675	45517
6-14-73	755397		755815			
		6571		764	7335	46281
6-21-73	762386		763150			
		5402		98	5500	46379
6-28-73	768552		768650			
		5949		1361	7310	47740
7-5-73	774599		775960			
		5300		630	5930	48370
7-12-73	781260		781890			
		3890		490	4380	48860
Leachate This Sheet		19493	Distribution This Sheet		201420	
Leachate Prior Sheet		601381	Distribution Prior Sheet		644204	
Total Leachate		796364	Total Distribution		845624	

* 400 gallons leachate lost due to equipment failure.

COUNTY OF SONOMA

PLATE H-26 H

FLUID ROUTING CELL "D"

Date	Leachate Collection: Meter Reading	Leachate Collection: Total Gal. Leachate Generated (1-3)	Distribution (Leachate & Fresh Water): Fresh Water Added: Meter Reading	Distribution (Leachate & Fresh Water): Fresh Water Added: Gallons Added (3-1)	Distribution (Leachate & Fresh Water): Total Distribution (4+2)	Fluid Retained in Refuse (4+6)
	1	2	3	4	5	6
7-19-73	785780		786270			
7-26-73	790909	4639	791820	911	5550	49771
8-2-73	796940	5120	797870	930	6050	50701
8-9-73	805382	7512	806540	1158	8670	51859
8-16-73	812777	6237	812950	173	6410	52032
8-23-73	819099	6149	819280	181	6330	52213
8-30-73	826090	6810	826630	540	7350	52753
9-6-73	832967	6337	833230	263	6600	53016
9-14-73	838238	5008	838320	82	5090	53098
9-21-73	844506	6186	845070	564	6750	53662
9-28-73	851070	6000	851070	0	5000	53662
10-5-73	857130	6060	857290	160	6220	53822
10-12-73	863400	6110	863400	0	6110	53822
10-19-73	869979	6579	871080	1101	7680	54923
10-26-73	879540	8460	880210	670	9130	55593
11-2-73	886453	6243	886810	357	6600	55950
11-9-73	893870	7060	894160	290	7350	56240
11-16-73	904270	10110	904270	0	10110	56240
11-23-73	913920	9650	913920	0	9650	56240

Leachate This Sheet	120270	Distribution This Sheet	127650
Leachate Prior Sheet	796364	Distribution Prior Sheet	845624
Total Leachate	916634	Total Distribution	973274

COUNTY OF SONOMA

PLATE H-26 I

FLUID ROUTING CELL "D"

Date	Leachate Collection: Meter Reading	Leachate Collection: Total Gal. Leachate Generated (1-3	Distribution (Leachate & Fresh Water): Fresh Water Added: Meter Reading	Distribution (Leachate & Fresh Water): Fresh Water Added: Gallons Added (3-1)	Distribution (Leachate & Fresh Water): Total Distribution (4+2)	Fluid Retained in Refuse (4+6)
	1	2	3	4	5	6
11-30-73	921240	7320	921240	0	7320	56240
12-7-73	928230	6990	928230	0	6990	56240
12-14-73	933840	5610	933840	0	5610	56240
12-21-73	939680	5840	939680	0	5840	56240
12-28-73	947140	7460	947140	0	7460	56240
1-4-74	956290	9150	956290	0	9150	56240
1-11-74	966390	10100	966390	0	10100	56240
1-18-74	974500	8110	974500	0	8110	56240
1-30-74	992220	17720	992220	0	17720	56240
2-8-74	997920	7700*	997920	-2000*	5700	54240
2-15-74	1006203	8283	1007540	1337	9620	55577
2-22-74	1018220	10680	1018220	0	10680	55577
3-4-74	1038340	20120	1038340	0	20120	55577
3-8-74	1048100	9760	1048100	0	9760	55577
3-15-74	1064390	16290	1064390	0	16290	55577
3-22-74	1078860	14470	1078860	0	14470	55577
3-29-74	1096810	17950	1096810	0	17950	55577
4-3-74	1115710	18900	1115710	0	18900	55577

Leachate This Sheet	202453	Distribution This Sheet	201790
Leachate Prior Sheet	916634	Distribution Prior Sheet	973274
Total Leachate	1119087	Total Distribution	1175064

*2000 gallons leachate lost due to pump failure.

COUNTY OF SONOMA

PLATE H-26J

FLUID ROUTING CELL "D"

Date	Leachate Collection		Distribution (Leachate & Fresh Water)			Fluid Retained in Refuse (4+6)
	Meter Reading	Total Gal. Leachate Generated (1-3)	Fresh Water Added		Total Distribution (4+2)	
			Meter Reading	Gallons Added (3-1)		
	1	2	3	4	5	6
4-12-74	1147420	41710	1147420	0	41710	55577
4-19-74	1169040	21620	1169040	0	21620	55577
4-26-74	1195260	26220	1195260	0	26220	55577
5-3-74	1223600	28340	1223600	0	28340	55577
5-10-74	1234920	11320	1234920	0	11320	55577
5-20-74	1244280	9360	1244280	0	9360	55577
5-24-74	1249075	4795	1249400	325	5120	55902
5-31-74	1256905	7505	1258070	1165	8670	57067
6-7-74	1267098	9028	1268350	1252	10280	58319
6-14-74	1280678	12328	1281700	1022	13350	59341
6-20-74	1293389	11689	1294110	721	12410	60062
6-27-74	1308310	14200	1308310	0	14200	60062
7-5-74	1313940	5630	1313940	0	5630	60062

Leachate This Sheet	203745	Distribution This Sheet	208230
Leachate Prior Sheet	1119087	Distribution Prior Sheet	1175064
Total Leachate	1322832	Total Distribution	1383294

COUNTY OF SONOMA

PLATE H-26 K

APPENDIX I

TEST CELL REFUSE PLACEMENT HISTORY

TEST CELL REFUSE PLACEMENT HISTORY

CELL A

DATE	EVENT	ADDED LIQUID	RAINFALL
11/ 5/71	Started Placing Refuse		
11/12/71	Rain		0.29"
11/13/71	Rain		0.25"
11/15/71	Finished Placing Refuse (530.35 Tons)		
11/15/71	Started Placing Cell Cover		
11/16/71	Rain		0.02"
11/17/71	Cell Cover in Place		
11/22/71	Shot Initial Settlement Elevation		
	Compacted Refuse Density 1064 #/yd^3		

TEST CELL REFUSE PLACEMENT HISTORY

CELL B

DATE	EVENT	ADDED LIQUID	RAINFALL
11/16/71	Started Placing Refuse		
11/19/71	Switched Refuse Placement to Cell E		
11/24/71	Resumed Refuse Placement		
11/29/71	Rain		0.96"
12/ 1/71	Finished Placing Refuse (524.23 Tons)		
12/ 2/71	Rain		0.50"
12/ 3/71	Rain		0.32"
12/ 6/71	Rain		0.24"
12/ 6/71	Add Water from Water Truck	20,000 gal.	
12/ 7/71	Add Water from Water Truck (69.25" in tank D as run off from Cell B. 69.25" = 829 gallons)	14,000 gal*	
12/ 8/71	Started Placing Cell Cover		
12/ 9/71	Rain		0.27"
12/10/71	Rain		0.09"
12/10/71	Cell Cover in Place		
	Compacted Refuse Density 1052 #/yd^3		
	*14,000 gallons should be reduced by 829 gallons to determine total moisture added to cell		

PLATE I- 2

TEST CELL REFUSE PLACEMENT HISTORY

CELL C

DATE	EVENT	ADDED LIQUID	RAINFALL
12/ 1/71	Started Placing Refuse		
12/ 2/71	Rain		0.50"
12/ 3/71	Rain		0.32"
12/ 3/71	Switched Refuse Placement to Cell E		
12/ 6/71	Rain		0.24"
12/ 6/71	Resumed Placing Refuse		
12/ 7/71	Add Water from Water Truck (2,000 gal ran through the cell and out the tank)	4,000*	
12/ 9/71	Rain		0.27"
12/10/71	Rain		0.09"
12/11/71	Rain		0.03"
12/13/71	Rain		0.77"
12/13/71	Add Water from Water Truck	4,000 gal.	
12/13/71	Finished Placing Refuse (521.72 tons)		
12/13/71	Began Placing Muck Sand		
12/15/71	Rain		0.05"
12/17/71	Started Placing Distribution System		
12/21/71	Started Placing Cell Cover		
12/21/71	Cell Cover in Place		
12/21/71	405 gal. Leachate pumped from bottom tank and discarded	- 405 gal.	
	Compacted Refuse Density 1064 #/yd^3		
	*4,000 gallons should be reduced by 2,000 gallons to determine total moisture added to cell.		

TEST CELL REFUSE PLACEMENT HISTORY

CELL D

DATE	EVENT	ADDED LIQUID	RAINFALL
12/13/71	Started Placing Refuse		
12/15/71	Rain		0.05"
12/22/71	Rain		0.51"
12/23/71	Rain		0.22"
12/23/71	Finished Placing Refuse (530.97 Tons)		
12/24/71	Rain		0.06"
12/27/71	Rain - Leachate Collection Tank at bottom of Cell D was full and overflowing. Leachate held for recycling. Estimated volume, 1,500 gal.	- 1,500	1.77"
12/28/71	Pea Gravel Placed for Distribution System		
12/29/71	Rain		0.03"
12/29/71	Distribution System Installed		
12/29/71	Started Placing Cell Cover		
12/30/71	Cell Cover in Place		
	Compacted Refuse Density 1065 #/yd^3		

PLATE I- 4

TEST CELL REFUSE PLACEMENT HISTORY

CELL E

DATE	EVENT	ADDED LIQUID	RAINFALL
11/15/71	Started Placing Refuse		
11/16/71	Rain		0.02"
11/16/71	Septic Pumpings	1,000 gal	
11/16/71	Switched Refuse Placement to Cell B(@Ton 180.2)		
11/17/71	Septic Pumpings	1,000 Gal	
11/18/71	Septic Pumpings	800 Gal	
11/19/71	Septic Pumpings	2,200 Gal	
11/22/71	Resumed Refuse Placement		
11/22/71	Septic Pumpings	2,200 Gal	
11/23/71	Septic Pumpings	1,000 Gal	
11/24/71	Switched Refuse Placement to Cell B(@ Ton 424)		
11/29/71	Rain		0.96"
11/30/71	Septic Pumpings	2,200 Gal	
12/1/71	Septic Pumpings	2,600 gal	
12/2/71	Septic Pumpings	1,000 gal	
12/2/71	Rain		0.50"
12/3/71	Rain		0.32"
12/3/71	Resumed Refuse Placement		
12/3/71	Septic Pumpings	1,000 gal	
12/6/71	Rain		0.24"
12/6/71	Septic Pumpings	2,000 gal	
12/6/71	Finished Placing Refuse (521.93 Tons)		
12/7/71	Septic Pumpings	3,800 gal	
12/8/71	Septic Pumpings	2,100 gal	
12/9/71	Rain		0.27"
12/10/71	Rain		0.09"
12/10/71	Septic Pumpings	3,300 gal	
12/10/71	Started Placing Cell Cover		
12/11/71	Rain		0.03"
12/11/71	Septic Pumpings	1,000 gal	
12/12/71	Cell Cover in Place		
	Refuse Density 1047 #/yd^{3}		

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